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United States Department of Energy

Savannah River Site

Corrective Measures Implementation/Remedial Action Implementation Plan (CMI/RAIP) for the K-Area Burning/Rubble Pit (131-K) and Rubble Pile (631-20G) Operable Unit (OU) (U)

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Document Certification Page

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CMI/RAIP for the K-Area Burning/Rubble Pit (131-K) and Rubble Pile (631-20G) Operable Unit

"I certify under the penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designated to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations."

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LIST OF ACRONYMS AND ABBREVIATIONS

ARAR	Applicable or Relevant and Appropriate Requirement
BOA	Basic Order Agreement
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CMI/RAIP	Corrective Measures Implementation/Remedial Action Implementation Plan
COC	Constituent of Concern
CSM	conceptual site model
ERD	Environmental Restoration Division
FFA	Federal Facility Agreement
GWZA	groundwater mixing zone application
ha	hectare
HASP	Health and Safety Plan
IDW	Investigative Derived Waste
KBRP	K-Area Burning/Rubble Pit
KRP	K-Area Rubble Pile
LUCIP	Land-Use Control Implementation Plan
LUCAP	Land-Use Control Assurance Plan
m	meter
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
mg/kg	milligram/kilogram
mg/L	micrograms per liter
MNA	monitored natural attenuation
MZCL	mixing zone contaminant level
O&M	Operations and Maintenance
OSHA	Occupation, Safety and Health Agency
OU	operable unit
PAHs	polycyclic aromatic hydrocarbons
PCE	tetrachloroethylene
PCR	Post-Construction Report
QA	Quality Assurance
RAIP	Remedial Action Implementation Plan
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RFI/RI	RCRA Facility Investigation/Remedial Investigation
ROD	Record of Decision
SB/PP	Statement of Basis/Proposed Plan

SCDHEC	South Carolina Department of Health and Environmental Control
SMSRP/PPP	Stormwater Management and Sediment Reduction Plan/Pollution Prevention Plan
SRS	Savannah River Site
SVE	soil vapor extraction
TCE	trichloroethylene
US DOE	United States Department of Energy
US EPA	United States Environmental Protection Agency
WSRC	Westinghouse Savannah River Company

1.0 GENERAL DESCRIPTION

1.1 Purpose and Scope

This document provides the following items for the implementation of the selected remedial action established in the Record of Decision (ROD) (WSRC 2000a) for the K-Area Burning/Rubble Pit and Rubble Pile (KBRP/KRP) Operable Unit (OU):

- A general description of the location and history of the OU, description of the constituents of concern (COC) to be remedied, and an overview of the selected remedial action
- An outline of the necessary design tasks
- A design summary highlighting the results of each of the design tasks performed to accomplish the objectives of the selected remedial action
- A summary of the construction strategy addressing critical components of construction activities required to implement the remedial design
- Requirements for health and safety, waste management, contamination control, decontamination, quality assurance, quality control inspections, performance verification (sampling, testing/analysis, when applicable), post-construction operations, maintenance and institutional control, project closeout, post-construction monitoring, and a forecast schedule for implementation of the remedial action
- A forecast schedule and brief discussion of the contents of the upcoming post-ROD documents required by the Federal Facility Agreement (FFA) for the Savannah River Site (SRS)

1.2 General Description and History of the Unit

The K-Area Burning/Rubble Pit (KBRP) (131-K) and Rubble Pile (KRP) (631-20G) OU is listed as a Resource Conservation and Recovery Act (RCRA) 3004(u) Solid Waste Management Unit/Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) unit in Appendix C of the FFA for the SRS. The KBRP/KRP OU consists of two soil waste units and groundwater beneath the OU.

The KBRP/KRP is located in the south-central part of SRS (Figure 1). Historical photographs of K Area indicate that the KBRP was constructed between 1955 and 1956 as a shallow, unlined excavation measuring approximately 9 m (30 ft) wide, 73 m (240 ft) long, and approximately 2.4 m (8 ft) deep (Figure 2). Based on these dimensions, the total pit volume is approximately 1,580 m^3 (2,140 yd^3) and encompasses an area of approximately 0.07 ha (0.17 acres). This pit appears to have been used for waste burning and burial. During operation, organic liquids of unknown use and origin, waste oils, paper, plastics, and rubber were disposed of in the pit and burned periodically (WSRC 1998a). Disposal records, including composition, origin, and use of materials disposed, were not kept for this unit during its operation. The use of the KBRP for disposal of combustible wastes was discontinued in 1973. After 1973, only inert rubble was placed in the pit. When the pit became full, it was backfilled with soil to grade level.

Historical photographs of K Area indicate that use of the KRP began between 1956 and 1961. The KRP consists of a general disposal area, semicircular in shape, measuring approximately 91 m (300 ft) long and 16 to 41 m (50 to 135 ft) wide, with an area of approximately 0.6 ha (1.5 acres) (Figure 2). Individual rubble piles within the area are 1.2 to 1.8 m (4 to 6 ft) high. The total estimated waste volume is 2,140 m^3 (2,800 yd^3). The KRP is composed primarily of soil matter, with some broken asphalt, broken concrete pieces, and gravel-sized coal.

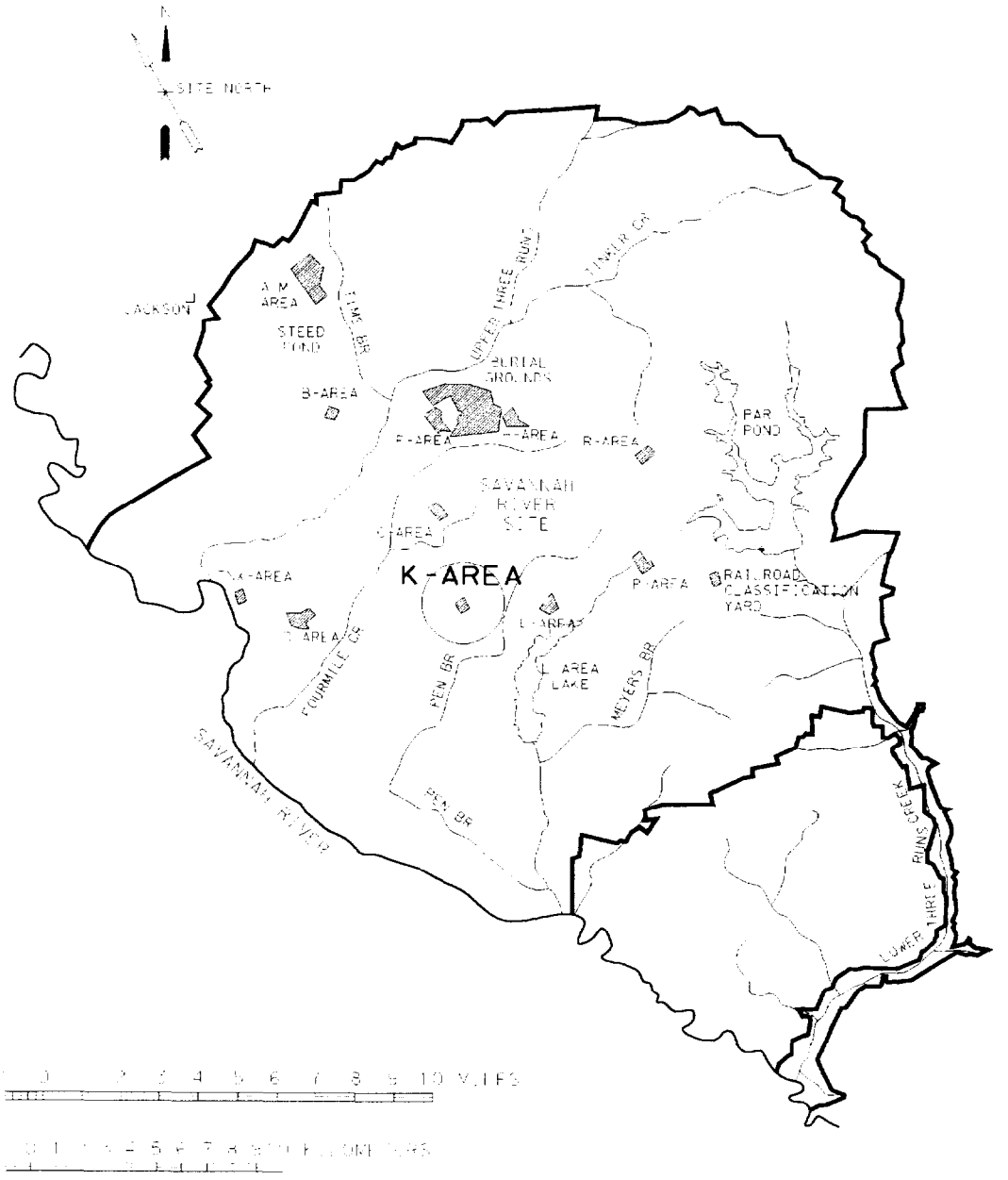

Figure 1. Location of K-Area Burning/Rubble Pit (131-K) and Rubble Pile (631-20G) OU

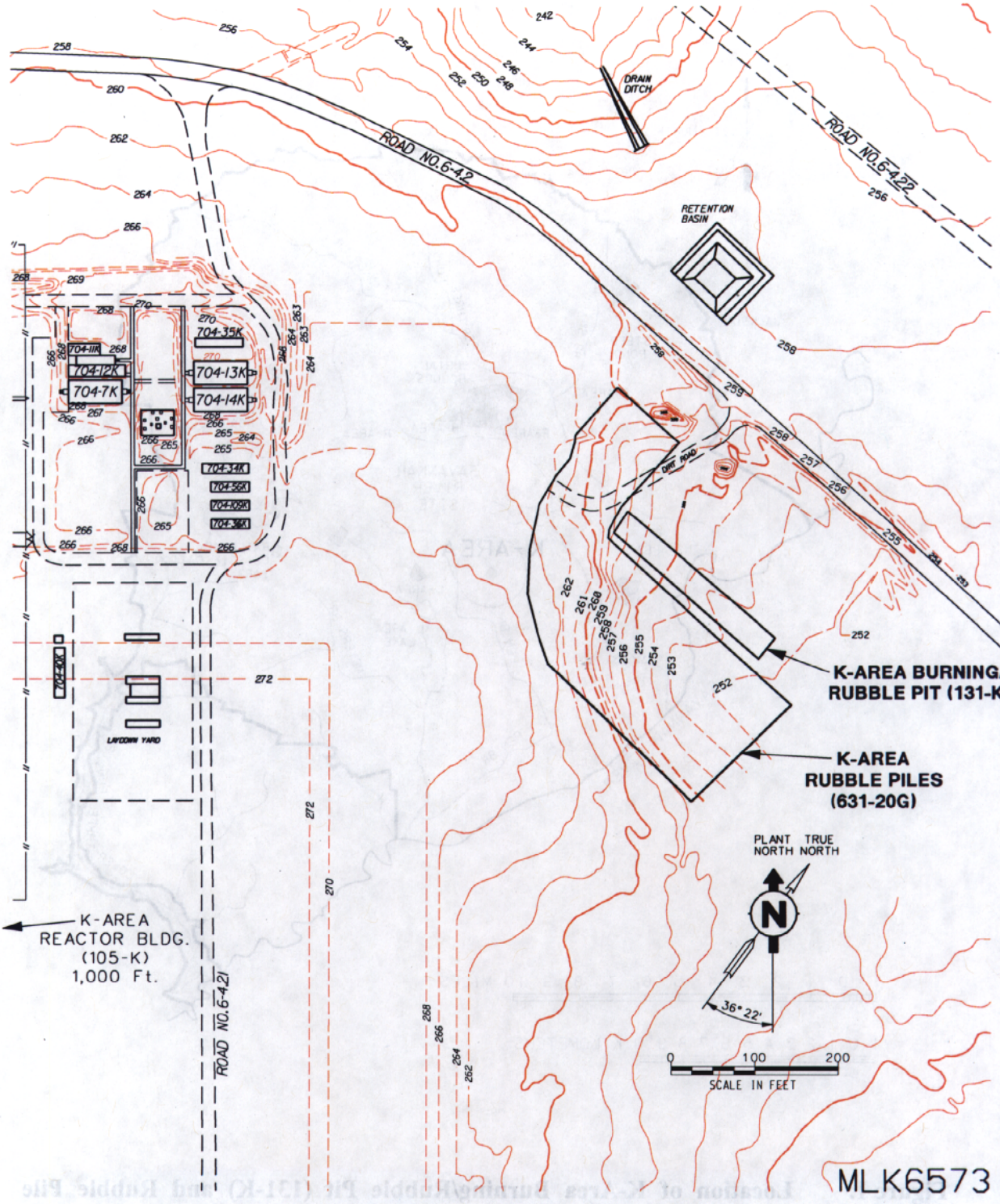

Figure 2. KBRP and KRP Operable Unit Layout

The coal and asphalt materials exist in a wide range of sizes and are dispersed in a highly heterogeneous manner throughout the piles. Disposal records were not kept for this unit during its period of operation. During the RCRA Facility Investigation/Remedial Investigation (RFI/RI), soil samples were collected from individual rubble piles as part of the pit and pile area evaluation (WSRC 1998a).

1.3 Nature and Extent of Contamination

Polycyclic aromatic hydrocarbons (PAHs) and arsenic in the soil and tetrachloroethylene (PCE) and trichloroethylene (TCE) in groundwater are the primary risk drivers at the KBRP/KRP OU. Table 1 identifies COCs and the associated risks for the KBRP, KRP, and groundwater. Remedial goals for soil are based upon the risk to the future industrial worker. The remedial goals for groundwater are based upon the Water Quality Protection of Human Health as established by South Carolina Regulation 61-68 of the Pollution Control Act.

The lateral and vertical extent of PAHs exceeding remedial goals in the KBRP waste and soil is shown in Figures 3 through 5. The lateral and vertical extent of PAHs and arsenic exceeding remedial goals in the KRP waste are shown in Figures 6 and 7. The lateral extent of PCE and TCE exceeding maximum contaminant levels (MCL) levels in groundwater is shown in Figures 8 and 9. Each of these figures presents the nature and extent of contamination and associated risks for the industrial worker consistent with the future land use for the OU.

Table 1. Constituents of Concern, Risks to Future Industrial Workers, and Remedial Goals for K-Area Burning/Rubble Pit and Rubble Pile Operable Unit

Unit	COCs	Basis/Receptor	Baseline Risk	Remedial Goals (for 10^{-6} or HQ=0.1)
KBRP Soil	benzo(a)anthracene	Future Industrial Worker	3.70×10^{-5}*	6.24 mg/kg[a]
	benzo(a)pyrene		3.70×10^{-4}*	0.624 mg/kg[a]
	benzo(b)fluoranthene		5.00×10^{-5}*	6.24 mg/kg[a]
	benzo(k)fluoranthene		2.50×10^{-6}*	62.4 mg/kg[a]
	dibenzo(a,h)anthracene		5.40×10^{-5}*	0.624 mg/kg[a]
	indeno(1,2,3-c,d)pyrene		2.14×10^{-5}*	6.24 mg/kg[a]
KRP Soil	benzo(a)anthracene	Future Industrial Worker	1.81×10^{-5}*	6.24 mg/kg[a]
	benzo(a)pyrene		1.45×10^{-4}*	0.624 mg/kg[a]
	benzo(b)fluoranthene		2.30×10^{-5}*	6.24 mg/kg[a]
	indeno(1,2,3-c,d)pyrene		8.70×10^{-6}*	6.24 mg/kg[a]
	arsenic		3.35×10^{-5}*	7.96 mg/kg[c]
KBRP and KRP OU Water Table Aquifer	tetrachloroethylene	Future Industrial Worker and Exceedance of MCL	1.6×10^{-6}**	5.0 µg/L[b]
	trichloroethylene		1.10×10^{-7}**	5.0 µg/L[b]

* Combines ingestion, inhalation, and dermal contact based on potential exposure to soil in the 0- to 1-foot interval.
**Risk based on potential exposure (ingestion) of groundwater.
a The remedial goal is based on the 1×10^{-6} target cancer risk to the hypothetical, future, industrial worker.
b The remedial goal is based on the Water Quality Protection of Human Health as established by South Carolina Regulation 61-68 of the Pollution Control Act.
c The remedial goal is based on two times the mean concentration of arsenic in background soil at the KBRP and KRP.
mg/kg = milligrams per kilogram
µg/L = micrograms per liter
mg/L = milligrams per liter

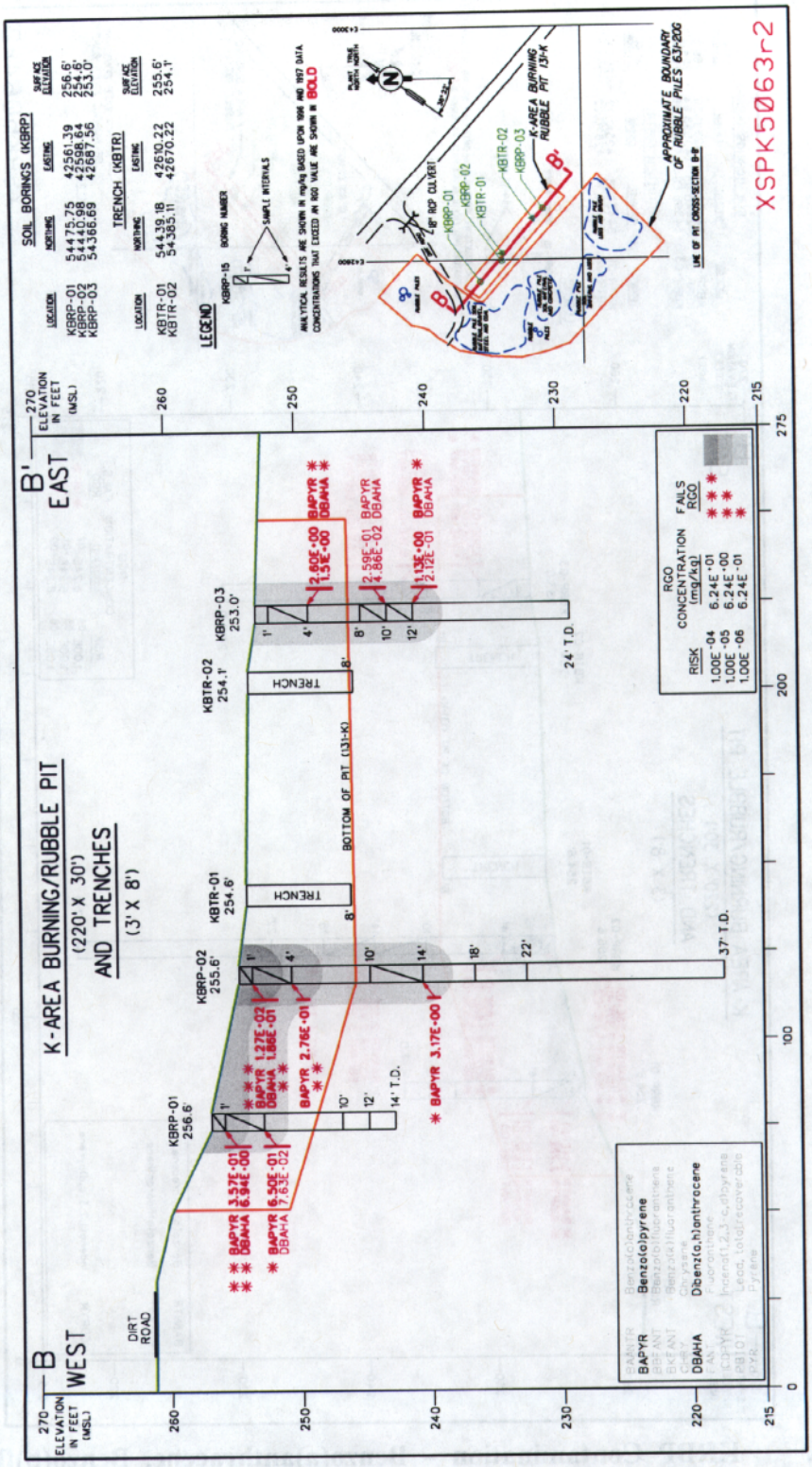

Figure 3. KRBP Contamination – Benzo(a)pyrene and Dibenzo(a,h)anthracene

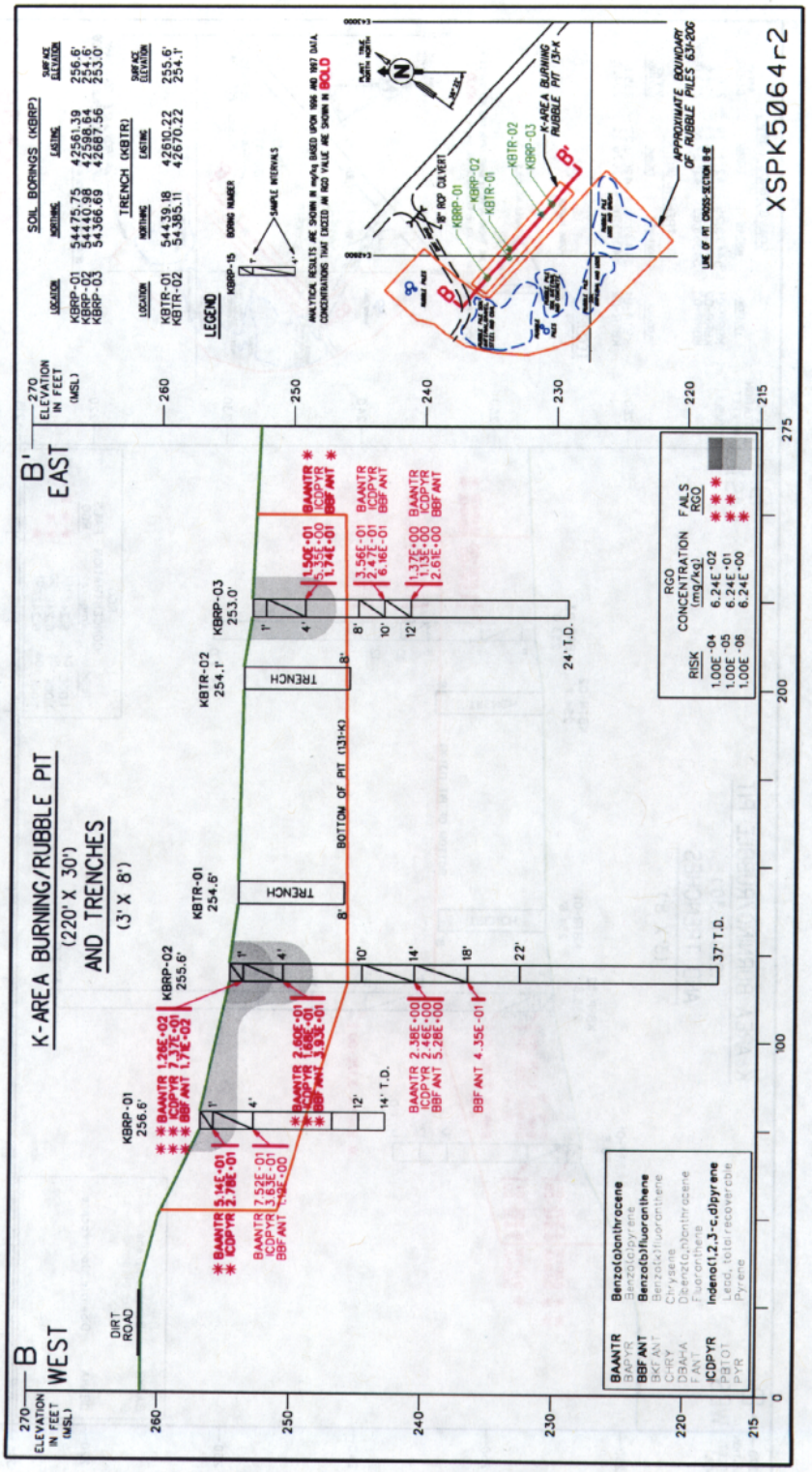

Figure 4. KRBP Contamination – Benzo(a)anthracene, Benzo(b)fluoranthene, and Indeno(1,2,3-c,d)pyrene

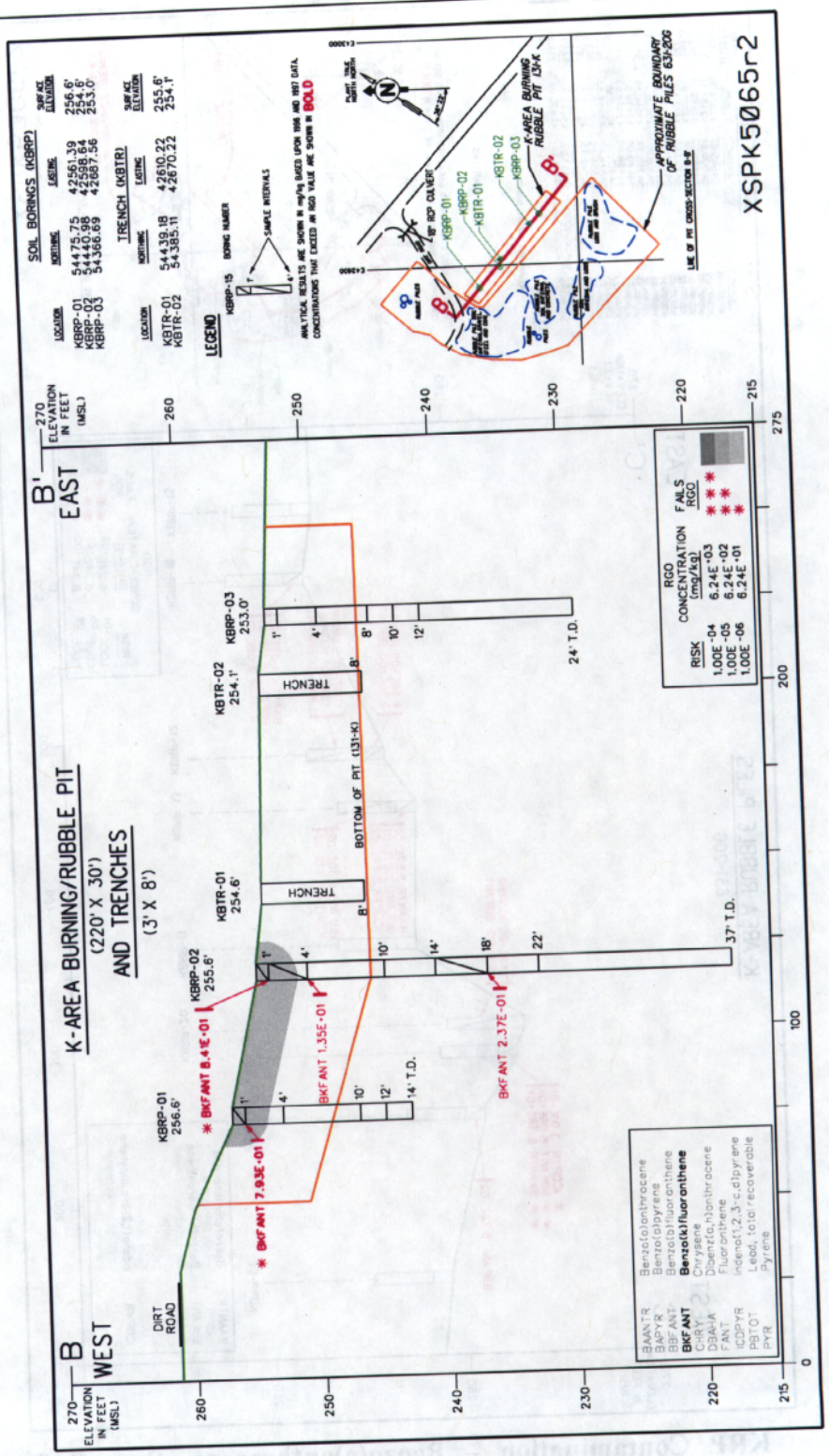

Figure 5. KRBP Contamination – Benzo(k)fluoranthene

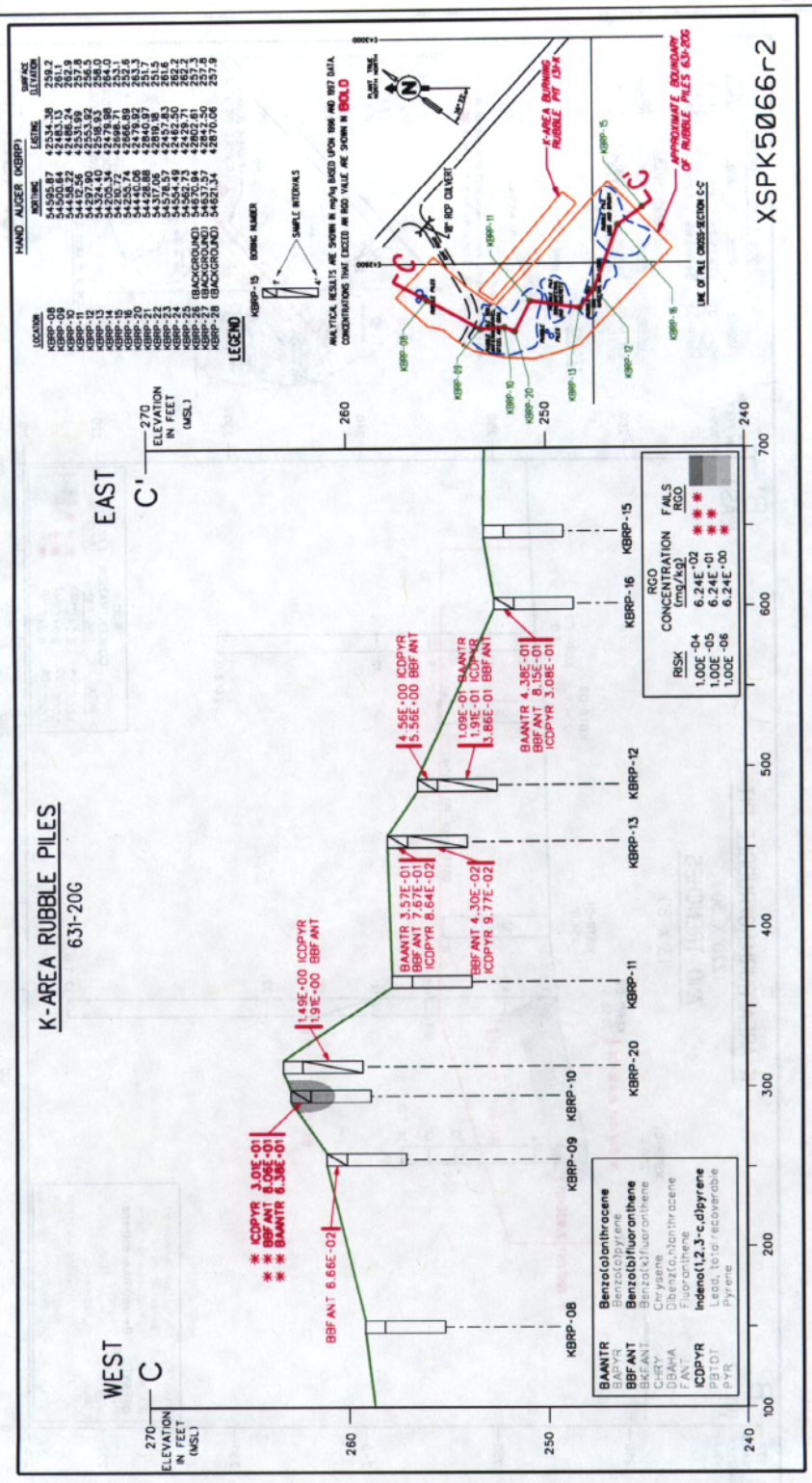

Figure 6. KRP Contamination – Benzo(a)anthracene, Benzo(b)fluoranthene, and Indeno(1,2,3-c,d)pyrene

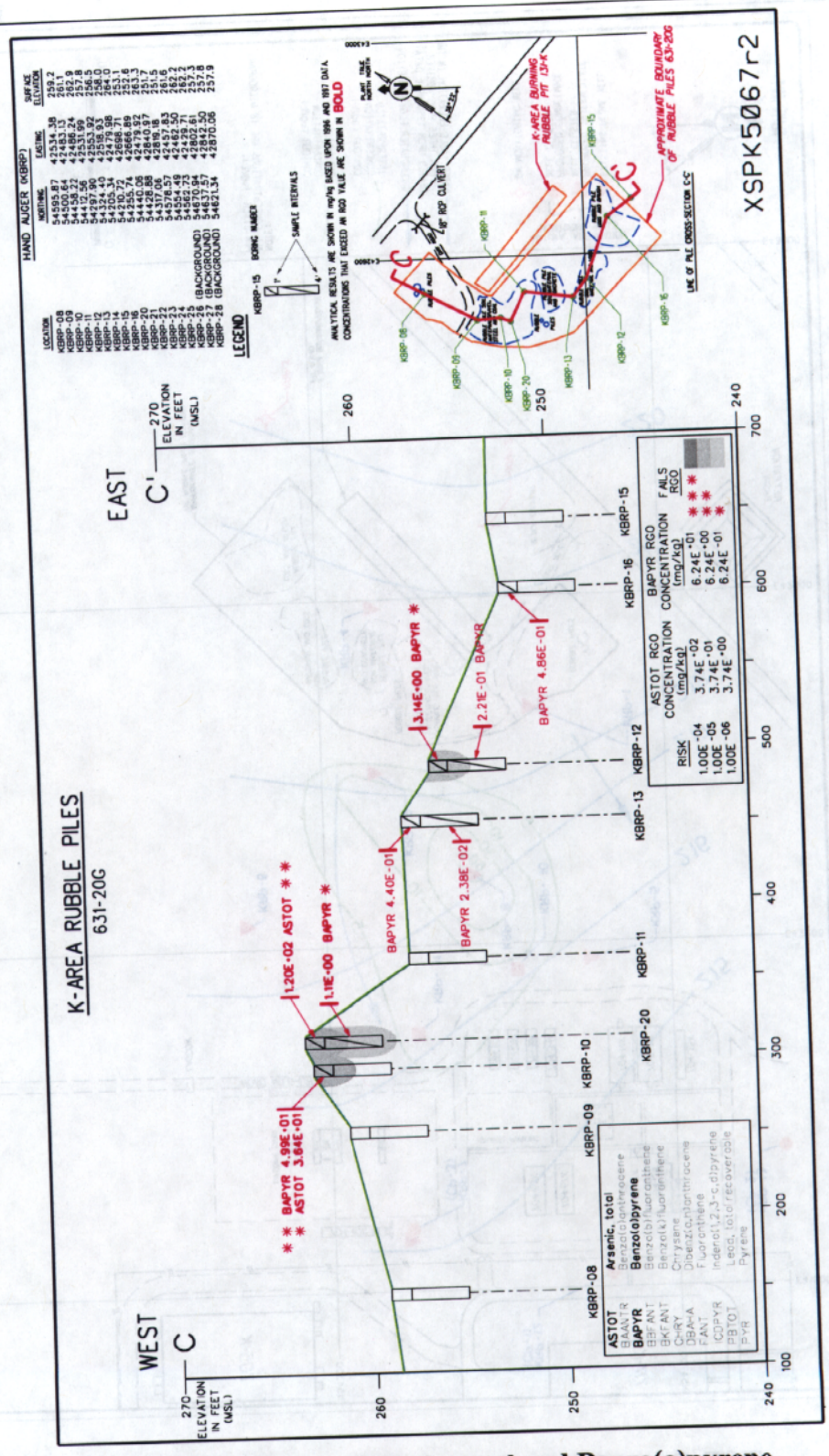

Figure 7. KRP Contamination – Arsenic, total and Benzo(a)pyrene

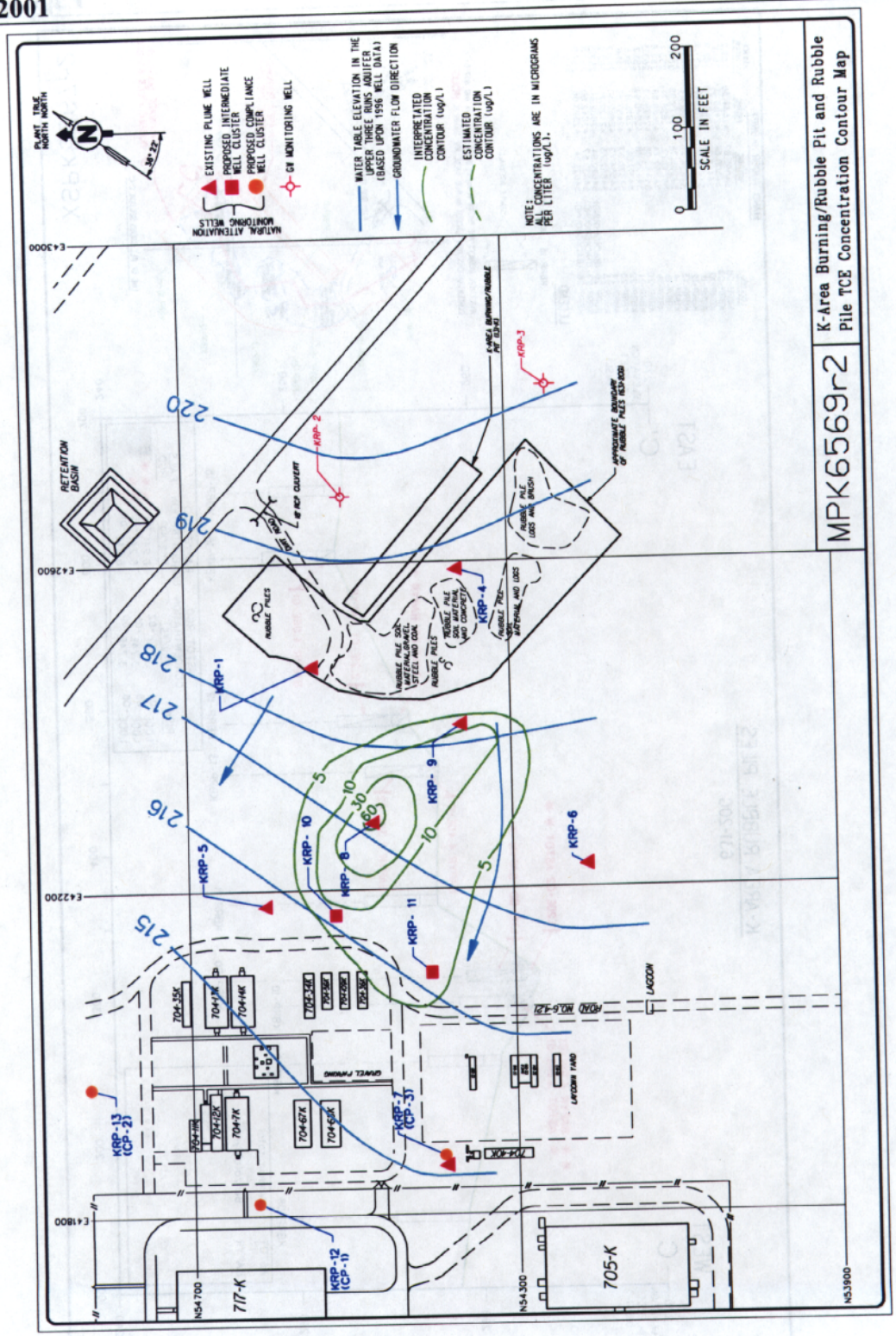

Figure 8. TCE Groundwater Contamination (based upon 1996 CPT Data)

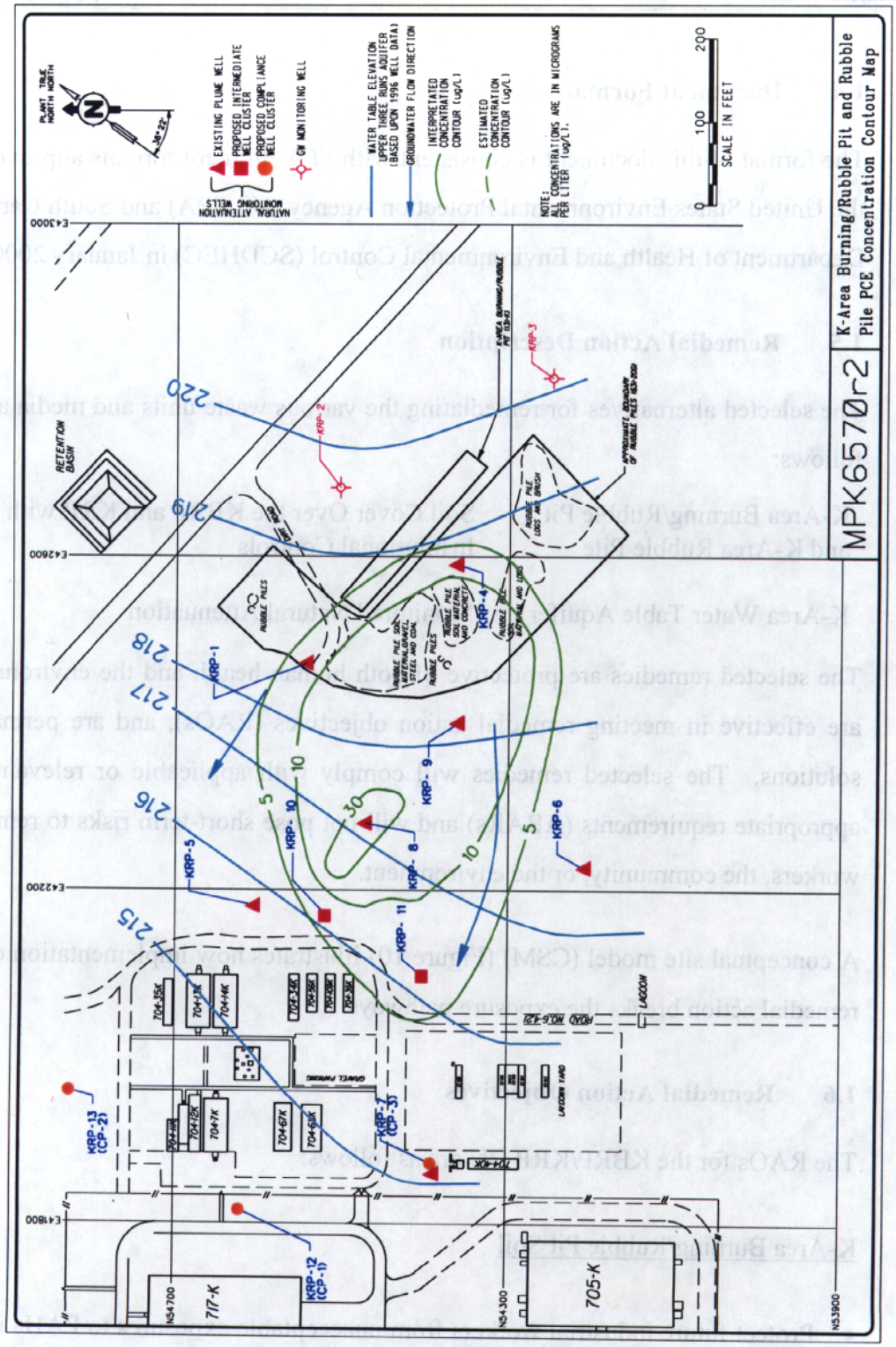

Figure 9. PCE Groundwater Contamination (based upon 1996 CPT data)

1.4 Document Format

The format of this document is consistent with FFA protocol formats approved by the United States Environmental Protection Agency (US EPA) and South Carolina Department of Health and Environmental Control (SCDHEC) in January 2000.

1.5 Remedial Action Description

The selected alternatives for remediating the various waste units and media are as follows:

K-Area Burning/Rubble Pit and K-Area Rubble Pile	Soil Cover Over the KBRP and KRP with Institutional Controls
K-Area Water Table Aquifer	Monitored Natural Attenuation

The selected remedies are protective of both human health and the environment, are effective in meeting remedial action objectives (RAOs), and are permanent solutions. The selected remedies will comply with applicable or relevant and appropriate requirements (ARARs) and will not pose short-term risks to remedial workers, the community, or the environment.

A conceptual site model (CSM) (Figure 10) illustrates how implementation of the remedial action breaks the exposure pathways.

1.6 Remedial Action Objectives

The RAOs for the KBRP/KRP OU are as follows:

<u>K-Area Burning/Rubble Pit Soil</u>

- Protect future industrial workers from unacceptable exposures to PAHs in soil at the KBRP.

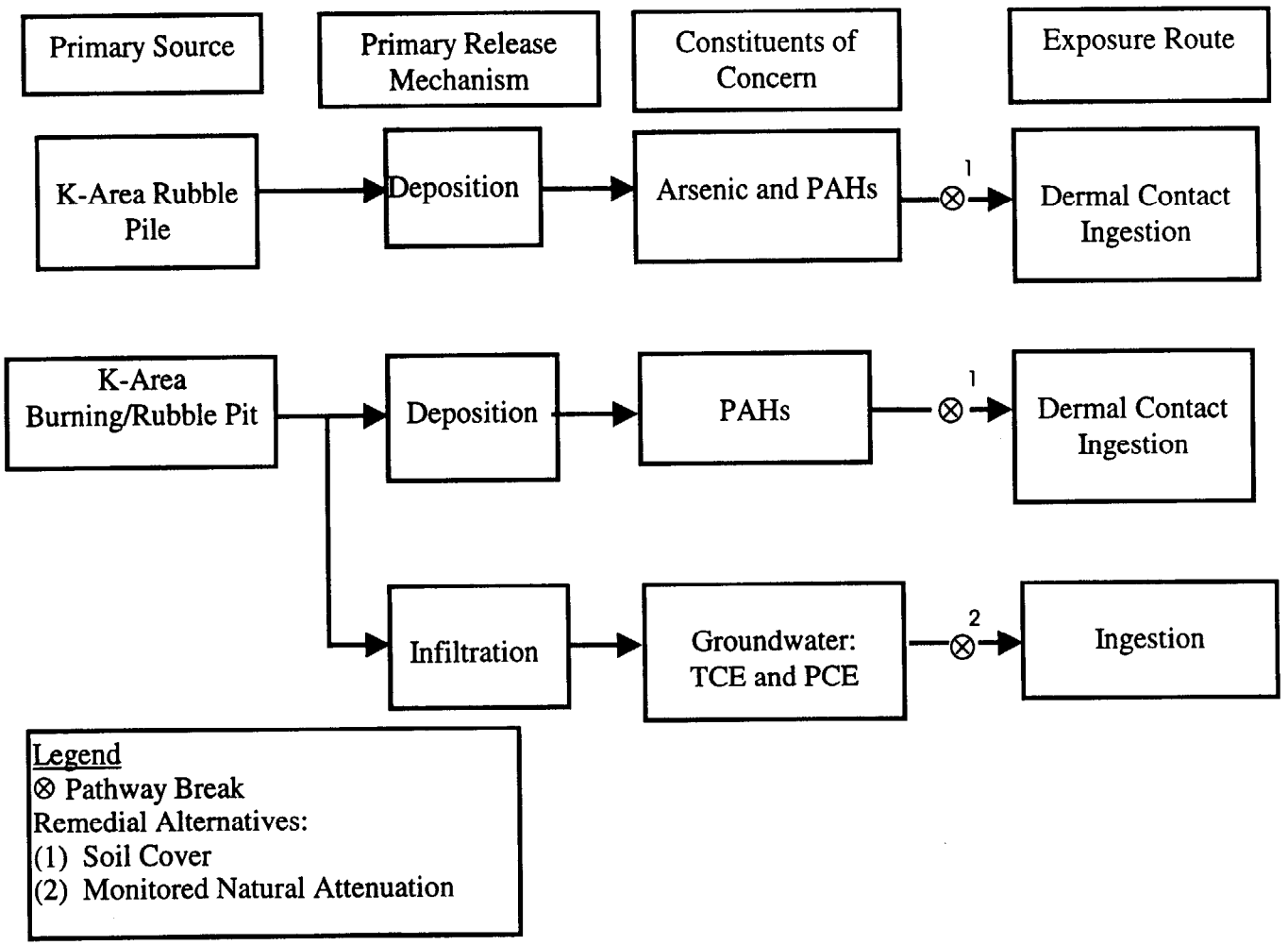

Figure 10. Conceptual Site Model for the KBRP/RP with Remedy Applied

K-Area Rubble Pile Soil

- Protect future industrial workers from unacceptable exposures to PAHs and arsenic in soil at the KRP.

Water Table Aquifer Groundwater

- Protect future industrial workers from unacceptable exposures to PCE and TCE in groundwater.

- Prevent further degradation of groundwater and return it to levels below MCLs to allow beneficial uses.

The wastes within the KBRP and KRP are low-level threat wastes under US EPA Principal Threat and Low-Level Threat Wastes Guidance (US EPA 1991). Risks related to low-level threat wastes normally can be safely mitigated through containment and institutional controls and do not necessarily require treatment.

1.7 Post-ROD Implementation Schedule

The Post-ROD schedule shown in Figure 11, KBRP/KRP Post-ROD Implementation Schedule, contains the forecast of construction activities.

1.8 Community Relations

A 45-day public comment period for the Statement of Basis/Proposed Plan (SB/PP) (WSRC 2000d) began on February 18, 2000, and ended on April 2, 2000. The SB/PP was also presented to the SRS Citizens Advisory Board

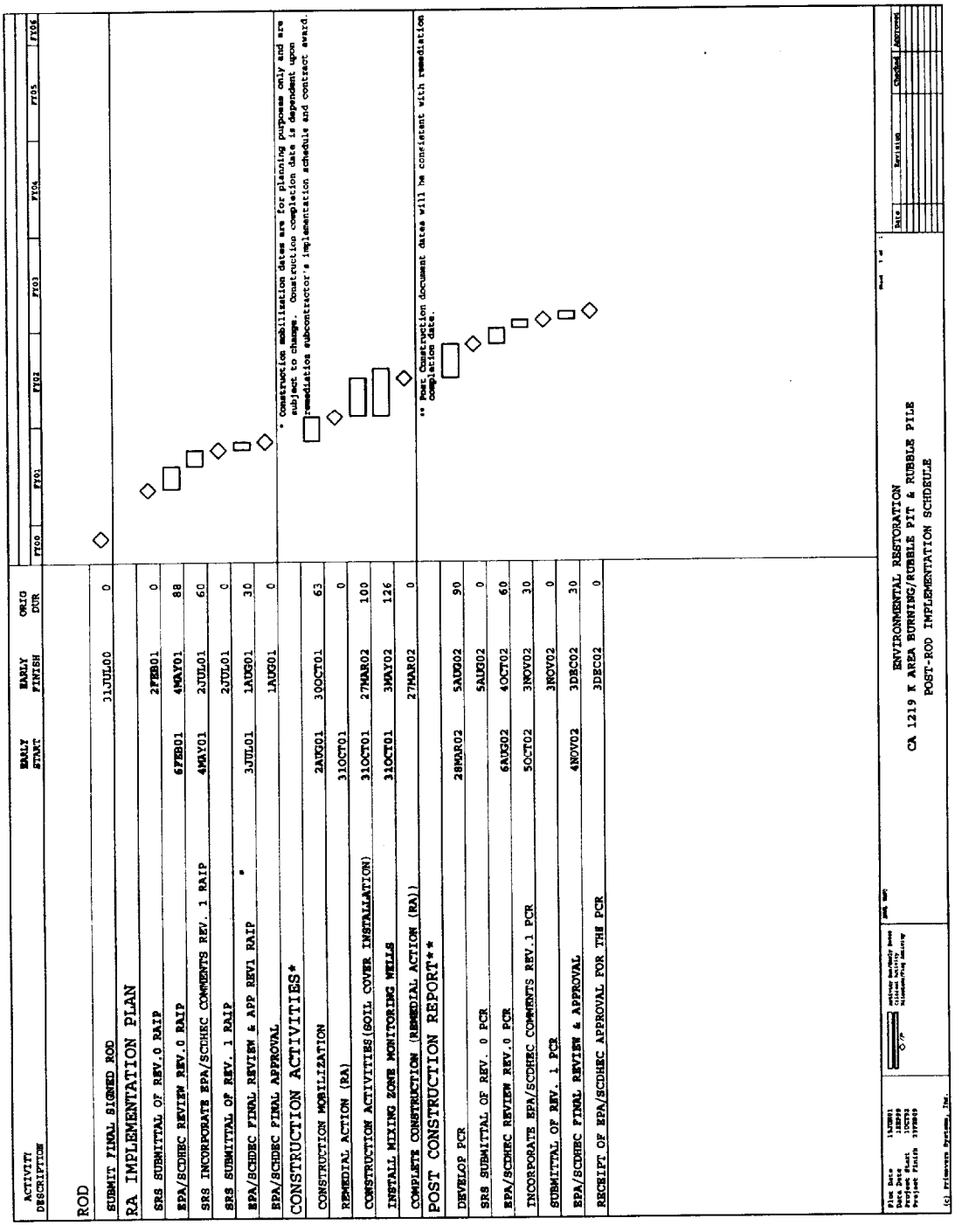

Figure 11. KBRP/KRP Post-ROD Implementation Schedule

Environmental Remediation Committee on March 7, 2000, in an open public meeting. No comments were received during the public comment period. After approval of the final engineering design Remedial Action Implementation Plan (RAIP), the US DOE will issue a public notice of the availability of a fact sheet.

2.0 REMEDIAL DESIGN

2.1 Design Strategy

A definitive remedial design was developed for the KBPR/KRP soil cover system to meet the RAOs and ARARs in accordance with the ROD. The design was translated into a specification and drawings for implementation by a constructor. Additional surveys were performed to develop the necessary design criteria, limits of soil cover, design details, and specification requirements.

Based on the design and specification, a contract will be awarded to a qualified constructor selected through the SRS procurement process. The qualified constructor will implement the design and perform construction activities in accordance with the specification requirements.

2.2 Design Activities

The following design activities have been completed to support the implementation of the selected remedial action for the KBRP/KRP unit:

- Survey of KBRP/KRP topography (Drawing SK-C-5369)
- Development of the design drawings (Section 2.5)
- Preparation of a Stormwater Management and Sediment Reduction Plan/Pollution Prevention Plan (SMSRP/PPP) (Section 3.1)

- Preparation of design technical information for closure of the KBRP/KRP (Section 2.6)

2.3 Design Deliverables

The design deliverables for this remedial action are listed below:

- Drawings (Attachment A)
- Construction Specification (summarized in Section 2.6)
- SMSRP/PPP (Section 3.1) (A copy of the approved SMSRP/PPP is provided as Appendix D.
- Groundwater Mixing Zone Application (GMZA) (WSRC 1999) (All pertinent design criteria and details associated with groundwater remediation are documented in the GMZA).

2.4 Design Criteria

The KBRP/KRP soil remedial design contains two key aspects that include 1) a soil cover system and 2) land use controls. (The ARARs in Table 2 constitute the basis for the remedial design criteria.) Descriptions of these key aspects are summarized below.

Table 2. Chemical-, Action-, Location - Specific ARARs

Citation(s)	Status	Requirement Summary	Reason for Inclusion
Chemical			
40 Code of Federal Regulations (CFR) 141 – MCLs and MCLGs and SC R.61-58.5 – MCLs and MCLGs	Relevant and Appropriate	Identifies MCLs and MCLGs for groundwater that may be a source of drinking water	MCLs should generally be met for cleanup of groundwater under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) program. MCLs are an ARAR that is relevant but will not be met due to the interim remedy waiver.
SC R.61-68 Water Classification	Relevant and Appropriate	States official classified water uses for all surface and groundwater in South Carolina.	Mandates meeting MCLs for groundwater unless a Mixing Zone is established. Groundwater Mixing Zone guidance allows developing alternative compliance levels for groundwater.
Action			
29 CFR 1910 Occupational Worker Safety (OSHA)	Applicable	Identifies health and safety requirements for remediation workers.	Worker activities involving hazardous materials must be conducted according to a project health and safety plan.
40 CFR 50.6	Applicable	States that the concentration of particulate matter (PM_{10}) in ambient air shall not exceed 50 $\mu g/m^3$ (annual arithmetic mean) or 150 $\mu g/m^3$ (24-hour average concentration).	Earth-moving activities will generate airborne dust that will have the potential to exceed the levels specified. Dust suppression will likely be required to minimize dust emissions.
SC R61-58.2 Construction and Operation Permits – Groundwater Sources and Treatment	Relevant and Appropriate	Prescribes minimum standards for the construction of groundwater sources and treatment facilities.	Groundwater wells must be installed/abandoned and drilling wastes disposed in a manner to prevent cross-contamination of aquifers.
SC R.61-107.11, Part IV, Subtitle D, Closure	Applicable	Identifies acceptability of waste disposed.	Wastes must meet acceptability requirements.
SC R.61-107.11, Part IV, Subtitle G, Closure	Applicable	Identifies regulations for closure of a debris landfill mandate requirements for a two-foot cover, slope to provide appropriate drainage, and a vegetative cover.	Closure covers must meet specifications for appropriate thickness, drainage, and vegetation.
SC R61-62.6 Section III, Control of Fugitive Particulate Matter	Applicable	Describes how particulate matter must be controlled in such a manner and to the degree that it does not create an undesirable level of air pollution.	Earth-moving activities have the potential to generate airborne particulate matter.
SC R61-71, Well Construction Standards	Applicable	Prescribes minimum standards for the construction of groundwater wells	Standards for installation and abandonment of groundwater.
SC R.72-300 Standards for Stormwater Management and Sediment Reduction	Applicable	Describes the stormwater management and sediment control plan for land disturbances	Excavation activities will require an erosion control plan.

2.4.1 Soil Cover System

The design of the soil cover system incorporates the following criteria:

- South Carolina Regulation 61-107, 11, Part IV, Subtitle G for closure of a debris landfill mandate requirements for a two-foot cover, slope to provide appropriate drainage, and a vegetative cover.

- South Carolina Regulation 61-107, 11, Part IV, Subtitle D for closure allows waste, contaminated soil, and mixed debris to remain in place.

2.4.2 Land Use Controls

The area subject to land use controls is based on the final soil cover configuration and the extent of groundwater subject to groundwater attenuation. Signs will be posted to identify the area subject to land use controls. Details are provided in the Land Use Control Implementation Plan of the OU (Appendix A).

2.5 Design Drawings

The following drawings (Attachment A) are necessary for implementation of the remedial design in conjunction with the construction specifications summarized in Section 2.6.

- SK-C-5369, Site Grading Plan

- SK-C-5370, Sections and Details

2.6 Design Technical Information

2.6.1 Constructor's Qualifications

The constructor will provide documented or demonstrated evidence of capability to perform the required activities to the satisfaction of the evaluators.

The constructor's team will comprise members qualified (management, technical and craft) to perform various tasks in accordance with the requirements in the contract.

The constructor will allow for proper coordination and oversight by the project team as needed to ensure technical compliance and quality assurance.

2.6.2 OU Preparation

Prior to installation of the soil cover, the area will be cleared. The area outside of the soil cover will be grubbed. Merchantable trees will be harvested and sold. The remaining trees will be dispositioned off unit.

The trees and vegetation are not contaminated and are not waste material. Therefore, sampling will not be performed on trees that will be removed from the OU. The tree stumps will be ground to prevent damage to the soil cover.

Monitoring well KRP-4 is located within the footprint of the soil cover. To ensure functionality, the well will be extended prior to the soil cover installation. Monitoring well KRP-3 is upgradient of the KBRP/KRP and is not required to monitor groundwater per the GMZA (WSRC 1999). KRP-3 will be abandoned as part of the remedial action.

2.6.3 Soil Cover Installation

Following OU preparation work, piles outside of the area to be covered will be moved into the covered area; and piles in the soil cover area will be graded to facilitate installation. The area outside of the soil cover will be graded. Approximately 6 inches of soil will be removed from the area outside of the cover during the grading process. Three inches of topsoil will be placed in the unit.

The soil cover has been designed to minimize the footprint (acreage) of the area subject to land use controls. The soil cover will be placed over the entire pit and most of the pile. At a minimum, the soil cover will be placed over KBRP-10, KBRP-12, and KBRP-20, chracterization sample locations that indicated soil contamination greater than remedial goals in the pile. SK-C-5369 (Attachment A) identifies the limits of the pit and pile and characterization sample locations KBRP-10, KBRP-12, and KBRP-20. The existing Investigation Derived Waste (IDW) Management unit and trenched area in the pit (constructed during the investigation) will remain in place and covered.

The soil cover will be installed per SK-C-5369 and SK-C-5370 (Attachment A) using conventional and commercially available earth-moving equipment. Material used for placement of the soil cover will be obtained from local SRS sources within a short distance from the OU. Since there are no RAOs related to contaminant migration, the soil cover will not have to meet a specific performance standard for permeability or leaching. The soil cover will be constructed in a manner to promote drainage away from the KBRP/KRP. Vegetation shall be placed over the graded cover to match local vegetation. Engineered controls, procedures, and verification sampling will be implemented to ensure protection of workers, prevent erosion, limit sediment runoff, and control fugitive dust generation.

2.6.4 Soil Sampling, Analysis and Monitoring

Approximately six inches of soil will be removed from the area outside of the soil cover area. Confirmatory sampling will be performed to verify that COC concentrations are less than remedial goals in the area outside of the soil. Analysis will be limited to the KRP COCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-c,d)pyrene, and arsenic). Where confirmatory samples exceed the remedial goals, additional soil will be removed (in 6-inch lifts). Soil removal and sampling will continue until COC concentrations are less than the remedial goals. All soil removed will be used as fill material under the cover.

3.0 PERMITTING REQUIREMENTS

3.1 Stormwater Management and Sediment Reduction Plan/Pollution Prevention Plan

The remedial action will comply with the SMSRP/PPP (Appendix D). The plan has been completed in accordance with South Carolina Stormwater Management and Sediment Reduction Regulation R.72-300 and submitted to SRS Environmental Protection Department for approval per SCDHEC-issued *General Permit for Land-Disturbing/Construction Activities at SRS*, dated December 14, 1996. The total area of disturbance covered by the SMSRP/PPP is approximately 2.5 acres. A copy of the approved SMSRP/PPP is provided for reference (WSRC 2000b).

4.0 CONSTRUCTION

4.1 Construction Strategy

The construction of the remedial action will be performed by a qualified construction team in accordance with the design drawings and specifications summarized in Sections 2.6. The construction team will be selected in accordance

with the requirements of SRS procurement procedures to ensure the project is performed properly and safely (Section 2.6.1).

During construction, the KBRP/KRP project team (composed of members from United States Department of Energy (US DOE) and several departments of the SRS Environmental Restoration Division (ERD)) will provide engineering and construction oversight, including surveillance of construction activities, as necessary, for quality assurance. Following the award of the construction subcontract and after receipt of the construction team's schedule for construction activities, SRS will provide US EPA and SCDHEC with a forecast of the significant milestones of remedial construction activities. SRS will interface with US EPA and SCDHEC to arrange visits to the KBRP/KRP construction site.

A summary of requirements for critical construction activities related to KBRP/KRP closure is provided in the subsequent sections.

4.2 Construction Activities

The following critical components of the construction activities will be necessary for the construction of the soil cover system and implementation of groundwater attenuation:

1. Authorization and mobilization

2. Modification of existing monitoring well within the soil cover area

3. Implementation of the approved SMSRP/PPP

4. Preparation of the OU

5. Soil removal

6. Confirmatory sampling

7. Construction of a soil cover system

8. Performance of final grading and vegetation

9. Performance of miscellaneous closeout activities

10. Installation of monitoring wells to support mixing zone

11. Installation of signs per Land Use Control Implementation Plan

12. Closeout of project, including final (Project Team, US EPA, and SCDHEC) walkdown for acceptance of the closed KBRP/KRP. (SRS will provide US EPA and SCDHEC with a forecast of the significant milestones of remedial construction activities.)

Construction activities will also include implementation of access controls to the construction OU, safety and health protection of personnel, contamination control, waste management/minimization, sampling, field and laboratory testing, analysis, and other related activities. The results of quality control inspections and tests performed during construction will be documented.

4.3 Remedial Design Change Control

4.3.1 Design Support During Construction

The project will maintain a cognizant engineering team during the construction of this remedial action. This team will oversee engineering and construction activities including review and approval of necessary design change documents. Construction changes will be kept to a minimum. Changes will be documented on the as-built drawings.

4.3.2 US EPA/SCDHEC Review of Remedial Design Changes

After design changes are incorporated, as-built drawings, corresponding to drawings SK-C-5369 and SK-C-5370 in this document, will be included in the Post-Construction Report (see Section 5.5). US DOE will notify US EPA and SCDHEC within a reasonable time frame when significant problems arise with any aspect of the remedial design/remedial action process. In particular, scheduling, budget, and implementability/technical issues will be brought to the attention of the regulators as soon these issues are identified. These notifications will follow established protocols for major and minor changes during construction. Major changes are those changes that have significant or fundamental effect on scope, performance or cost of the preferred alternative established in the ROD.

The Post-Construction Report will also contain a summary of design changes made during the construction phase.

4.4 Waste Disposal and Transport

Contamination in the KBRP and KRP area is limited to the soil. Based upon process history and soil sampling results, the vegetation is not considered contaminated; therefore, the trees and brush are not considered to be waste material. However, material below grade (i.e., soil, roots) will remain on unit. Merchantable trees will be harvested and sold. All other trees will be removed from the OU and dispositioned off unit. Secondary waste will be managed consistent with Table 3.

Table 3. Secondary Waste Disposition

Secondary Waste Stream	Waste Type	Description	Method of Disposal
Soil	Hazardous	Monitored natural attenuation well drillings	Well drillings above the water table will be disposed in the vicinity of the work site. The remaining well drillings will be containerized, sampled and compared to IDW Management Plan Non-Aqueous health-based limits. Well drillings below health-based limits will be disposed of in the vicinity of generation. Well drillings exceeding health-based limits but below RCRA characteristically hazardous limits will be managed as CERCLA sanitary waste. Well drillings exceeding RCRA characteristically hazardous limits will be managed as hazardous waste.
	Hazardous	Confirmatory lab sample returns	Lab sample returns will be placed on the KRP and covered by the soil cover.
Well development water	Hazardous	Development water from intermediate and compliance well clusters	Water will be managed and dispositioned in accordance with the approved IDW Management Plan. Any containerized development water found to exceed plan values will be sent to either the M-1 Air Stripper, the Effluent Treatment Facility, or the TNX facility at SRS, depending on the constituents found in the fluids. Both the Effluent Treatment Facility and the M-1 Air Stripper facilities are CERCLA Offsite Rule-approved. The TNX facility will serve as an alternate pending CERCLA Offsite Rule approval.
Job Control	Nonhazardous	Disposable Personal Protective Equipment (PPE)	PPE will be disposed of on the KRP and covered by the soil cover.
	Nonhazardous	Rinse water	Rinse water will be managed and dispositioned in accordance with the approved IDW Management Plan. Any containerized decontamination fluids found to exceed these values will be sent to either the M-1 Air Stripper, the Effluent Treatment Facility, or the TNX facility at SRS, depending on the constituents found in the fluids. Both the Effluent Treatment Facility and the M-1 Air Stripper facilities are CERCLA Offsite Rule-approved. The TNX facility will serve as an alternate pending CERCLA Offsite Rule approval.

The approach used to apply a clean soil cover will be to work (with machinery, etc.) from clean areas toward contaminated areas, thus avoiding contact with the contaminated soils. Wheels, tracks, blades, etc., will always be in contact with clean soil. If a vehicle should come in contact with contaminated soil, it will be decontaminated by brushing until clean. The soil moved during equipment decontamination will be returned to the area of contamination. After the first clean soil layer is applied and the area outside of the soil cover is confirmed clean by sampling, the remaining work will be performed in clean medium. Spoil material brought to the unit that cannot be used as clean backfill in the soil cover will be disposed of as clean material.

Soil cutting, decontamination fluids, development water, and purge water will be managed and dispositioned in accordance with the approved Investigation-Derived Waste Management Plan (WSRC 1994). Any decontamination fluids or purge water found to exceed these values will be sent to either the M-1 Air Stripper, the Effluent Treatment Facility, or the TNX Facility at the SRS, depending on the constituents found in the fluids. Both the M-1 Air Stripper and the Effluent Treatment Facility facilities are CERCLA Offsite Rule Approved. The TNX Facility will be an alternate pending CERCLA Offsite Rule Approval and regulator notification requirements outlined in Section 4.3.2.

4.5 Quality Assurance

Quality assurance (QA) for the remedial action is provided through implementation of the performance requirements specified in the design documents (design drawings and specification). Design documents are developed in accordance with WSRC Manual E7, *Conduct of Engineering and Technical Support*, to ensure quality work and conformance with the requirements of the WSRC Manual 1Q, *Quality Assurance Manual.*

The construction of this remedial action will be performed by a construction team qualified through the SRS procurement process. If offsite forces are used, a Basic Order Agreement (BOA) subcontract will be awarded. The BOA includes companies that have been prequalified to perform environmental remediation activities at SRS.

Quality control inspections of all critical construction activities related to implementation of the remedial action will be performed. The inspections will ensure conformance to the specified requirements and the acceptance criteria. Frequency and results of all quality control inspections performed will be recorded. A summary of the results of the quality control tests and inspections will be provided in the Post-Construction Report (see Section 5.5)

At appropriate phases of the construction period, the project team will perform timely review and approval of the constructor's documents for process control and performance verification. The project team will also provide independent surveillance and engineering oversight of the constructor's construction activities, including monitoring progress toward completion of the construction scope. The team will audit tests and inspection records, as necessary, to ensure compliance with the US EPA/SCDHEC-approved CMI/RAIP.

As stated in Section 4.2, SRS will coordinate with the US EPA and SCDHEC to arrange their visits to the construction site.

4.6 Non-Conformances

All non-conformances to the specified acceptance criteria (Section 2.5) identified in inspection reports will be evaluated, resolved, or rectified as described in the pertinent sections of this document. Design changes resulting from resolution of

non-conformance conditions, if applicable, will be processed per Section 4.3, Remedial Design Change Control.

4.7 Health and Safety Plan

A Site-Specific Health and Safety Plan (HASP) (WSRC 2000c) has been prepared in accordance with 29 CFR, Part 1910, Section 120, Occupational Safety and Health Administration (OSHA) and will be implemented by the remediation subcontractor. The HASP has been approved in accordance with SRS procedures, and a copy will be available at the job site at all times. A copy of the HASP is also provided herewith for reference as Appendix E.

The plan describes the following:

- Dust suppression requirements related to 40 CFR 50. 6 and South Carolina Regulation 61-62.6
- Required actions by the facility personnel in case of fires, explosions, or any unplanned releases of hazardous waste
- Arrangements with onsite security, fire department, medical facility, and emergency response teams to coordinate emergency services
- Names, addresses, and phone numbers (office and home) of all persons qualified to act as emergency coordinators
- Emergency equipment available at the facility
- Evacuation plan for facility personnel

5.0 POST CONSTRUCTION

5.1 Post-Construction Monitoring

Post-construction monitoring will be limited to performance monitoring of the natural attenuation process in the KBRP/KRP groundwater. Groundwater sampling and analysis will be performed in accordance with the GMZA (WSRC 1999).

5.2 Contingency Plan Implementation Strategy

If groundwater attenuation does not progress as expected, US DOE and regulatory authorities have considered an active contingency measure. Evidence of unsatisfactory attenuation progress will include longer than expected or unreasonable remedial times, exceeded intermediate concentration levels, or exceeded MCLs at compliance points. Air sparging with passive soil vapor extraction (SVE) has been approved in the KBRP/KRP ROD as the contingency measure if natural attenuation does not progress as modeled (WSRC 2000a). A corrective action plan will be completed within 90 days after a trigger level has been confirmed. Any changes to the approved contingency remedy other than air sparging with passive SVE as described in the ROD will be documented in the Administrative Record File through a memo, an explanation of significant difference, or a ROD amendment, depending upon the magnitude of the change. Details of the contingency plan are provided as an attachment to the Groundwater Mixing Zone Application for the K-Area Burning/Rubble Pit and Rubble Pile (WSRC 1999).

5.3 Operations, Maintenance, and Institutional Control

No operational processes are required for this soil remedial action. Once installed, the cover will be inspected semi-annually (Appendix A, Attachment B) and maintenance will be performed as required to ensure protection of human health and the environment.

Land-use controls will be implemented as necessary to prevent future, industrial workers from potential exposure to groundwater at the KBRP/KRP OU. Land use controls implemented at the OU will consist of future land-use restrictions and access controls such as signs. A land use control implementation plan (LUCIP) has been developed for the KBRP/KRP. The plan details how SRS will implement, maintain, and monitor the land use control elements for the KBRP/KRP OU to ensure that the remedial actions remain protective of human health and the environment (Appendix A). Soil cover inspection and maintenance will be a component of the LUCIP. Once approved, the LUCIP will be appended to the SRS Land Use Control Assurance Plan.

Because these remedies result in hazardous substances remaining onsite above levels that allow for unlimited use and unrestricted exposure, a review will be conducted within five years after initiation of remedial actions to ensure that the remedies continue to provide adequate protection of human health and the environment.

5.4 Requirements for Project Closeout

5.4.1 Confirmatory Sampling and Analysis

To minimize the soil cover, contamination within the KRP footprint will be consolidated. Areas of the KRP will be rolled back by removing approximately six inches of soil. The soil removed will be consolidated within the covered area.

Confirmatory sampling will be performed in the excavated areas. The sampling plan in Appendix C will be utilized to perform confirmatory sampling. Additional soil will be removed as necessary.

5.4.2 Groundwater Attenuation

Groundwater attenuation will be confirmed for project closeout in accordance with the GMZA (WSRC 1999). The GMZA (WSRC 1999) established a long-term groundwater monitoring program to ensure maximum Mixing Zone Concentration Limits (MZCL) are not exceeded. The GMZA predicts that any exceedance of these maximum MZCLs will lead to an exceedance in MCLs at the compliance level (i.e., MZCL) for each GMZA monitoring well are listed in Tables 11 and 12 of the GMZA.

5.4.3 Final Acceptance of the Soil Cover

Completion of construction will be verified by the project team for conformance with the specified requirements and the acceptance criteria. The verification by the project team will include review of all documents submitted by the constructor as well as periodic surveillance of construction activities during the construction. Prior to submittal of the Post-Construction Report, a final walkdown by the project team and the constructor will be performed to observe the completed soil cover. As stated in Section 4.2, consistent with the forecast schedule of milestones of construction activities, SRS will coordinate with US EPA and SCDHEC for their participation in the final walkdown.

5.4.4 Achievement of Remedial Action Objectives

RAOs will be met when specified performance-based design requirements are implemented in accordance with the action plan described in this document. Consistent with the CSM (Figure 10), each RAO will be achieved as follows:

- K-Area Burning/Rubble Pit Soil RAO: Future industrial workers will be protected from unacceptable exposure to PAHs in soil by a two-foot soil cover over the KBRP and land use controls. (The two-foot soil cover exceeds the one-foot cover requirement to be protective of the future industrial worker.) The soil cover eliminates exposure pathways thus preventing the future industrial worker from unacceptable exposure. Land use controls will be implemented to ensure that the soil cover integrity is maintained and to prevent inadvertent exposure to the future industrial worker by limiting activities in the vicinity of the KBRP.

- K-Area Rubble Pile Soil RAO: Future industrial workers will be protected from unacceptable exposure to PAHs and arsenic in soil by a two-foot soil cover over the KRP and land use controls. (The two-foot soil cover exceeds the one-foot cover requirement to be protective of the future industrial worker.) The soil cover eliminates exposure pathways, thus preventing the future industrial worker from unacceptable exposure. Land use controls will be implemented to ensure that the soil cover integrity is maintained and to prevent inadvertent exposure to the future industrial worker by limiting activities in the vicinity of the KRP.

- Water Table Aquifer Groundwater RAO #1: Future industrial workers will be protected from unacceptable exposure to PCE and TCE in the groundwater by establishing a groundwater mixing zone and implementing land use controls. The groundwater mixing zone delineates the area where PCE and TCE concentrations pose unacceptable exposure to the future industrial worker. Land use controls will be implemented to prevent the future industrial worker from inadvertent exposure by limiting activities in the area defined by the groundwater mixing zone.

- Water Table Aquifer Groundwater RAO #2: Prevent further degradation of groundwater and return to levels below MCLs to allow beneficial uses will be achieved by establishing a groundwater mixing zone. The groundwater mixing zone establishes monitoring requirements to validate the groundwater model that predicts that the groundwater plume is shrinking and to verify that PCE and TCE concentration in the groundwater is decreasing to below MCLs. (WSRC 1999)

5.5 Schedule for Federal Facility Agreement Deliverables

The next FFA deliverable is the *Post-Construction Report (PCR)* (See Figure 11). The PCR will be submitted in accordance with the requirements for submittal of regulatory documents as identified in the FFA. It will include items such as a chronology of events; performance standards and construction quality control information; a description of the construction activities; final inspections; applicable Operations and Maintenance (O&M) plans (i.e., institutional control and maintenance plans per the KBRP/KRP LUCIP); a summary of project costs (i.e., construction/remediation costs); and the verification of compliance with the acceptance criteria based on the results of specified performance tests. A schedule for submittal of the Final Remediation Report will be provided in the Post-Construction Report.

6.0 REFERENCES

SCDHEC, 1997.*Groundwater Mixing Zone Application Guidance*, Department of Health and Environmental Control, Columbia, South Carolina, May

US DOE, 1996. *Savannah River Site Future Use Project Report,* United States Department of Energy, Savannah River Operations Office, Savannah River Site, Aiken, SC

US EPA, 1991. *A Guide to Principal Threat and Low Level Threat Wastes,* 9380.3-06 FS, United States Environmental Protection Agency

WSRC, 1994. *Investigation-Derived Waste Management Plan (U).* WSRC-RP-94-1227, Rev. 2. Westinghouse Savannah River Company, Savannah River Site, Aiken, SC

WSRC, 1998a. *RCRA Facility Investigation/Remedial Investigation Report with the Baseline Risk Assessment for the K-Area Burning/Rubble Pit (131-K) and Rubble Pile (631-20G) Operable Unit (U).* WSRC-RP-97-442. Westinghouse Savannah River Company, Savannah River Site, Aiken, SC, December

WSRC, 1998b. *Groundwater Flow and Solute Transport Modeling Report, K-Area Burning/Rubble Pit and Rubble Pile,* WSRC-RP-98-5052, Westinghouse Savannah River Company, May

WSRC, 1999. *Groundwater Mixing Zone Application for the K-Area Burning/Rubble Pit and Rubble Pile,* WSRC-RP-98-4084, Rev. 1.1, Westinghouse Savannah River Company, October

WSRC, 2000a. *Record of Decision Remedial Alternative Selection for the K-Area Burning/Rubble Pit (131-K) and Rubble Pile (631-20G) Operable Unit (U).* WSRC-RP-97-862. Westinghouse Savannah River Company, Savannah River Site, Aiken SC, July

WSRC, 2000d. *Statement of Basis/Proposed Plan Remedial Alternative Selection for the K-Area Burning/Rubble pit (131-K) and Rubble Pile (631-20G) Operable Unit (U),* WSRC-RP-97-861, Rev. 1.2, January

7.0 ATTACHMENTS

Attachment A Design Drawings

8.0 APPENDIX

Appendix A K-Area Burning/Rubble Pit and Rubble Pile LUCIP

Appendix B K-Area Burning/Rubble Pit and Rubble Pile Fact Sheet

Appendix C K-Area Burning/Rubble Pit and Rubble Pile Confirmatory Sampling Plan

Appendix D Stormwater Management and Sediment Reduction Plan/Pollution Prevention Plan

Appendix E Site-Specific Health and Safety Plan for K-Area Burning/Rubble Pit and Rubble Pile Remediation

ATTACHMENT A

LIST OF DESIGN DRAWINGS

SK-C-5369 Site Grading Plan

SK-C-5370 Sections and Details

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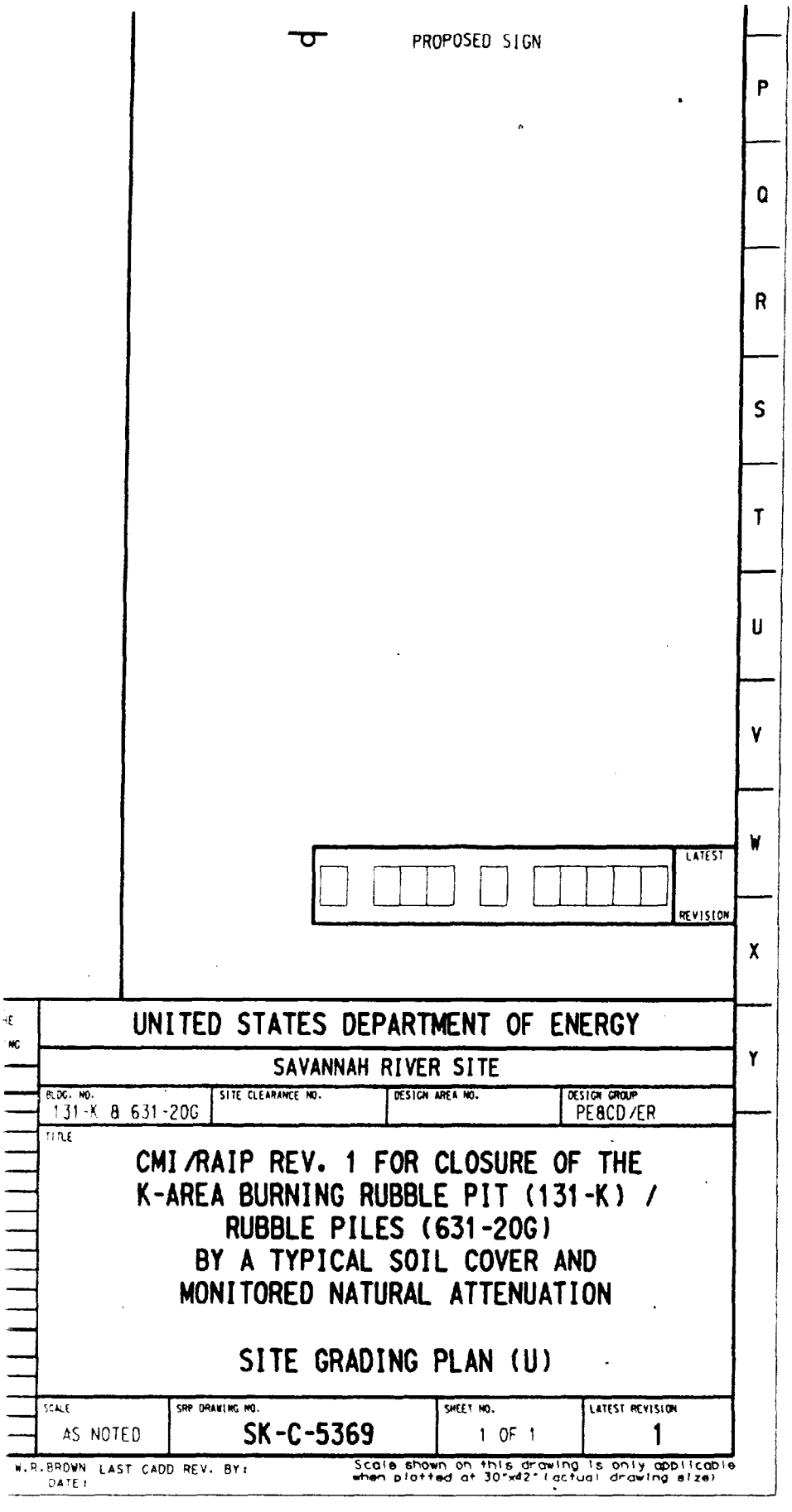
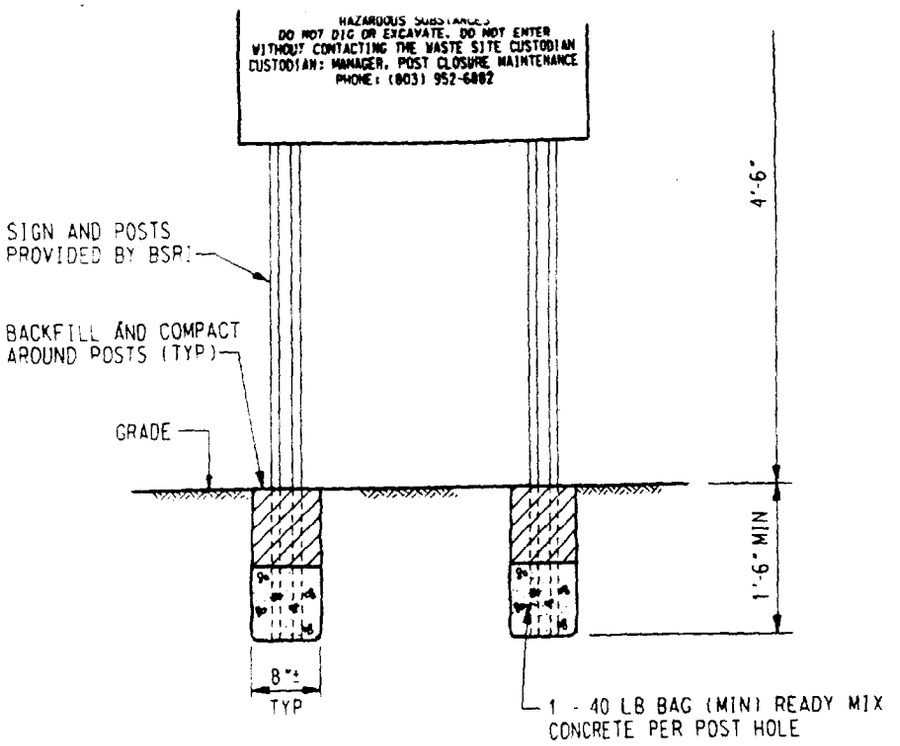


Site Grading Plan
SK-C-5369



DETAIL 4 (SK-C-5369)

NOT TO SCALE

CLOSED BURNING RUBBLE PIT/ RUBBLE PILE SIGNS

LATEST REVISION

APRV'D	APRV'D	APRV'D

REFERENCE DRAWINGS

SK-C-5369	SITE GRADING PLAN

REFERENCE STANDARDS

UNITED STATES DEPARTMENT OF ENERGY

SAVANNAH RIVER SITE

BLDG. NO.	SITE CLEARANCE NO.	DESIGN AREA NO.	DESIGN GROUP
131-K & 631-20G			PE&CD/ER

TITLE

CMI/RAIP REV. 1 FOR CLOSURE OF THE K-AREA BURNING RUBBLE PIT (131-K) / RUBBLE PILES (631-20G) BY A TYPICAL SOIL COVER AND MONITORED NATURAL ATTENUATION

SECTIONS AND DETAILS (U)

SCALE	SRP DRAWING NO.	SHEET NO.	LATEST REVISION
AS NOTED	SK-C-5370	1 OF 1	0

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012345678901234567890123456789012 3

PSC- 30 DRAWN BY (ORIG): W.R.BROWN LAST CADD REV. BY:
PLOT DATE 1/30/01 TIME DATE:

Scale shown on this drawing is only applicable when plotted at 30"x42" (actual drawing size)

Sections and Details
SK-C-5370

APPENDIX A
LUCIP
K-AREA BURNING/RUBBLE PIT (131-K) AND RUBBLE PILE (631-20G) OPERABLE UNIT

LAND USE CONTROL IMPLEMENTATION PLAN

This K-Area Burning/Rubble Pit and Rubble Pile (KBRP/KRP) Land Use Control Implementation Plan (LUCIP) will be appended to the SRS Land Use Control Assurance Plan (LUCAP).

Remedy Selection

Located in K Area in the south-central portion of Savannah River Site (SRS), the KBRP/RP operable unit (OU) lies approximately 4.5 km (5.9 miles) east of the nearest site boundary and 0.65 km (0.4 miles) east of K-Reactor Area (Figure 1 in the CMI/RAIP).

Historical photographs of K Area indicate that the K-Area Burning/Rubble Pit (KBRP) was constructed between 1955 and 1956. Used for waste burning and burial, the pit was a shallow, unlined excavation measuring approximately 9 m (30 ft) wide, 73 m (240 ft) long, and approximately 2.4 m (8 ft) deep. Based on its dimensions, the total pit volume is approximately 1,640 m^3 (2,140 yd^3) and encompasses an area of approximately 0.07 ha (0.17 acres).

During operation, organic liquids of unknown use and origin, waste oils, paper, plastics, and rubber were disposed of in the pit and burned periodically (WSRC 1998). Disposal records, including composition, origin, and use of materials disposed, were not kept for this unit during its operation. The use of the KBRP for disposal of combustible wastes was discontinued in 1973. When the pit became full, it was backfilled with soil to grade level.

Historical photographs of K Area indicate that the K-Area Rubble Pile (KRP) was constructed sometime between 1956 and 1961. The KRP consists of a general disposal area, semicircular in shape, measuring approximately 91 m (300 ft) long and 16 to 41 m (50 to 135 ft) wide, with an area of approximately 0.6 ha (1.5 acres). Individual rubble piles within the area are 1.2 to 1.8 m (4 to 6 ft) high. The total estimated waste volume is 2,140 m^3 (2,800 yd^3). The KRP is composed primarily of soil matter, with some broken asphalt, broken concrete pieces, and gravel-sized coal. The coal and asphalt exist in a wide range of particle sizes and are dispersed in a highly heterogeneous manner throughout the piles. As with the KBRP, disposal records were not kept for this unit during its period of operation. The RCRA Facility Investigation/Remedial Investigation (RFI/RI) included collecting soil samples from individual rubble piles as part of the pit and pile area evaluation (WSRC 1998).

Under the future industrial worker scenario, the Baseline Risk Assessment (BRA) identified final constituents of concern (COCs) for the KBRP (PAHs), KRP (PAHs and arsenic), and groundwater (PCE and TCE). The following COCs and associated risks were identified for the KBRP based on the future industrial worker: benzo(a)anthracene (3.70×10^{-5}), benzo(a)pyrene (3.70×10^{-4}), benzo(b)fluoranthene (5.00×10^{-5}), benzo(k)fluoranthene (2.50×10^{-6}), dibenzo(a,h)anthracene (5.40×10^{-5}), and indeno(1,2,3-c,d)pyrene (2.14×10^{-5}). The following COCs and associated risks were identified for the KRP based on the future industrial worker: benzo(a)anthracene (1.81×10^{-5}), benzo(a)pyrene (1.45×10^{-4}), benzo(b)fluoranthene (2.30×10^{-5}), indeno(1,2,3-c,d)pyrene (8.70×10^{-6}), and arsenic (3.35×10^{-5}).

The following COCs and associated risks were identified for KBRP and KRP groundwater based on the future industrial worker: tetrachloroethylene (1.6×10^{-6}) and trichloroethylene (1.10×10^{-7}).

The remedy selected for the KBRP/KRP OU is a soil cover system and monitored natural attenuation (MNA). This remedy entails the following actions:

- Installation of a soil cover system
- Installation of monitoring wells
- Implementation of land-use controls to ensure continued protection of human health and the environment

The post-remedial action conceptual site model (Attachment A) shows the broken pathways and the remaining residual risk to the future industrial worker.

According to the Savannah River Site Future Use Project Report (US DOE 1996), residential use of SRS land should be prohibited.

Land Use Controls

Considering the residual risks mentioned above, the land-use control objective is to:

- maintain the use of the OU for industrial activities only,
- prevent unauthorized access to the closed CERCLA unit as long as the waste remains a threat to human health and environment, and
- prevent unauthorized access to groundwater

Current access controls and a deed notification needed to maintain the future land use controls are described in the following sections of this LUCIP. The area subject to land use control is identified in SK-C-5373 (Attachment C).

Deed Notification

In the long term, if the property is ever transferred to nonfederal ownership, the US Government will take those actions necessary pursuant to Section 120(h) of CERCLA. Those actions will include a deed notification disclosing former waste management and disposal activities as well as remedial actions taken on the site. The deed notification shall, in perpetuity, notify any potential purchaser that the property has been used for the management and disposal of waste. These requirements are also consistent with the intent of the RCRA deed notification requirements at final closure of a RCRA facility if contamination will remain at the unit.

The deed shall also include deed restrictions precluding residential use of the property. However, the need for these deed restrictions may be reevaluated at the time of transfer in the event that exposure assumptions differ and/or the residual contamination no longer poses an unacceptable risk under residential use. Any reevaluation of the need for the deed restrictions will be done through an amended ROD with US EPA and SCDHEC review and approval.

In addition, if the OU is ever transferred to non-federal ownership, a survey plat of the area will be prepared by a certified professional land surveyor and recorded with the county recording agency.

Access Controls

On-Site Workers

In accordance with WSRC 1D, *Site Infrastructure and Services Manual*, Procedure 3.02, "Site Real Property Configuration Control," use of all lands and waters on SRS shall be coordinated via the Site Use Program. No use of land

(i.e., excavation or any other land use) shall be undertaken without prior approval from US EPA and SCDHEC.

To prevent unknowing entry and to ensure that unrestricted use of the waste unit does not occur while under ownership of the government, identification signs will be posted at the unit. The signs will be legible from a distance of at least 25 feet. The signs will read as follows:

> K-Area Burning/Rubble Pit (131-K) and Rubble Pile (631-20G)
>
> "Danger – Unauthorized Personnel Keep Out. This unit contains hazardous substances. Do not dig or excavate. Do not enter without contacting the waste site custodian."
>
> Custodian: Manager, Post-Closure Monitoring and Maintenance
>
> Phone: (803) 952-6882

Trespassers

While under the ownership of US DOE, access control of the entire SRS will continue to be maintained in accordance with the 1992 RCRA Part B Permit Renewal Application, Volume I, Section F.1. This section describes the 24-hour surveillance system (R.61-79.264.14(b)(1)), artificial or natural barriers (R.61-79.264.14(b)(2)(i)), control entry systems (R.61-79.264.14(b)(2)(ii)), and warning signs (R.61-79.264.14(c)) in place at the SRS boundary to comply with the security requirements for a RCRA-permitted facility.

Field Walkdowns and Maintenance for Institutional Controls

After the remediation of the KBRP/RP, only maintenance activities will be required per this remedial action. No operations will be required.

The results of any events and or actions that indicate some potential compromise of institutional controls will be documented in the FFA Annual Progress Report.

All other routine maintenance activities will be documented and maintained in files subject to US EPA and SCDHEC review and audit. A copy of the completed inspection form is maintained in the Environmental Restoration Division administrative record files. The land-use controls will be implemented as long as the waste remains a threat to human health or the environment.

The following steps will be implemented to maintain the low permeability soil cover for as long as it is necessary to prevent contaminant migration above MCL:

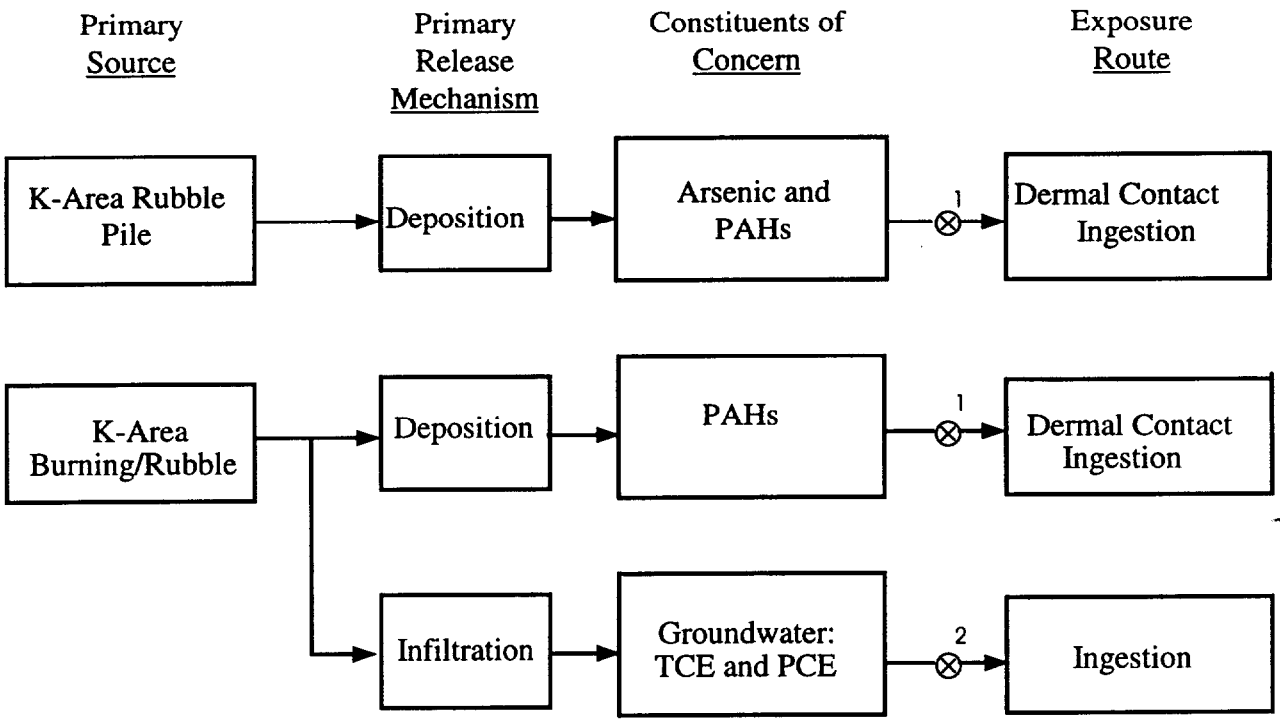
- Perform periodic (semi-annual) visual inspections for evidence of damage to the soil cover due to erosion or intrusion by burrowing animals. The inspection will also address upkeep of the vegetative cover and access control barriers (e.g., the warning signs). (Attachment B provides a typical example of an inspection data sheet for waste units).
- Perform necessary repairs (when required as identified during inspection) to maintain the functional integrity of the soil cover and the warning signs.
- Enforce SRS institutional controls through access controls by restricting access to the closed waste unit. Institutional controls will be maintained as long as the waste remains a threat to human health or the environment.
- As required by the National Oil and Hazardous Substance Contingency Plan (NCP), a five-year review of the ROD for the KBRP/RP unit will be performed as long as the waste remains a threat to human health or the environment.

The unit-specific LUCIP, including the inspection data sheet, will be revised as needed (e.g., after completion and construction activities and in response to the result of five-year reviews of the remedy) and appended to the SRS LUCAP.

Per Section 3.6 of the LUCAP, the post-construction revision of this LUCIP will identify the area under land-use restriction via a survey plat certified by a professional land surveyor.

ATTACHMENT A

K-AREA BURNING/RUBBLE PIT AND RUBBLE PIT POST-REMEDIAL ACTION CONCEPTUAL SITE MODEL



Legend
⊗ Pathway break
Remedial Alternatives:
(1) Soil Cover
(2) Monitored Natural Attenuation

ATTACHMENT B

(TYPICAL) ER INSPECTION DATA SHEET FOR WASTE SITES
Page 1 of 2

Waste Site: _____ A = Satisfactory X = Unsatisfactory (Comments required)	**A or X**	Comments or Corrective Action Taken (See Maintenance Register for Corrected Items)
Check for potential encroachments (Ensure that there is no building on the OU).		
Does the OU have brush or woody vegetation that needs cutting and disposal?		
Does the OU need grass cut?		
Verify that the wells and roads are accessible.		
Are the wells properly locked per R.61-71.11.C.6?		
Is the concrete pad cracked or broken? Is the pad undercut or silted over?		
Is the well properly identified per R.61-71.6.H?		
Verify that the wells' posts and protective covers are in place.		

ATTACHMENT B (Cont)

(TYPICAL) ER INSPECTION DATA SHEET FOR WASTE SITES
Page 2 of 2

Waste Site: _____ A = Satisfactory X = Unsatisfactory (Comments required)	**A or X**	Comments or Corrective Action Taken (See Maintenance Register for Corrected Items)
Verify that the waste unit signs have the correct information and that the information is legible.		
Does the OU show signs of erosion or subsidence? Are there any signs of burrowing animals (holes)?		
Verify that the orange ball markers are in place.		
Check the integrity of drainage ditches (if any) for presence of excessive erosion, sediment buildup, and any debris restricting water flow.		
Does the OU need general cleanup (housekeeping)?		
Comments:		

Inspected By:_____/_____Date:_____Time:_____
(Print Name) (Signature)
Reviewed By Post Closure Manager or Designee:_____/_____
(Print Name) (Signature)
Date:_____Time:_____

Note: EPA and SCDHEC must be notified within 30 days of identification of any area where any breach or compromise of restrictions placed on this institutional control OU has occurred

ATTACHMENT C

LAND USE CONTROL IMPLEMENTATION PLAN SURVEY PLAT

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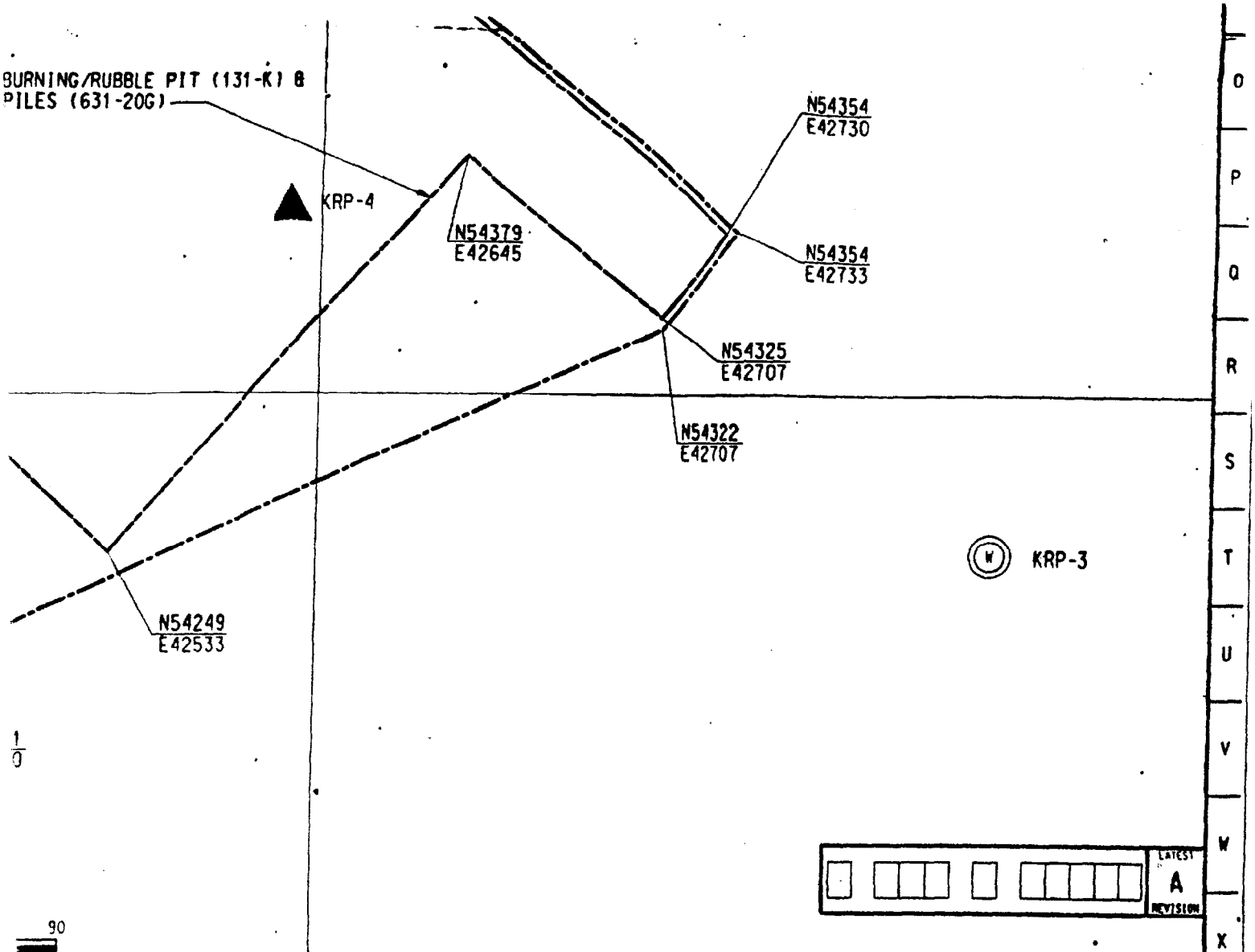

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REFERENCE DRAWINGS

REFERENCE STANDARDS

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UNITED STATES DEPARTMENT OF ENERGY

SAVANNAH RIVER SITE

BLDG. NO.	SITE CLEARANCE NO.	DESIGN AREA NO.	DESIGN GROUP
			PE&CD/ER

TITLE

K-AREA BURNING/RUBBLE PIT (131-K) AND RUBBLE PILES (631-20G)

LAND USE CONTROL IMPLEMENTATION PLAN SURVEY PLAT (U)

SCALE	SHP DRAWING NO.	SHEET NO.	LATEST REVISION
AS NOTED	SK-C-5373	1 OF 1	A

LATEST REVISION A

PSC: PLOT DATE 1/29/01 TIME

DRAWN BY (ORIG): M.R. BROWN LAST CADD REV. BY: DATE:

Scale shown on this drawing is only applicable when plotted at 30"x42" (actual drawing size)

Land Use Control Implementation Plan
Survey Plat (U)
SK-C-5373

APPENDIX B

K REACTOR AREA BURNING RUBBLE PIT AND RUBBLE PILE REMEDIAL ACTION FACT SHEET

Location

The K Reactor Area Burning Rubble Pit (KBRP) and K-Rubble Pile (KRP) Operable Unit (OU) consists of two waste units and a contaminant groundwater plume. The KBRP/KRP OU is situated in the central portion of the Savannah River Site (SRS) in Barnwell County, South Carolina approximately 6 miles east of the nearest site boundary and 0.5 miles east of K-Area Reactor.

History

The KBRP was a shallow unlined excavation measuring 30 ft wide, 240 ft long, and approximately 8 ft deep. Based on these dimensions, the total pit volume is estimated to be approximately 2140 cubic yards. The KBRP was constructed in 1951 for use as a burning pit. During operation of the pit, wood, paper, plastics, waste oils, rubber, and organic liquids of unknown use and origin were disposed of in the pit and burned periodically. No disposal records indicating composition, origin, or use of disposed materials were maintained for this unit during its period of operation. The use of the KBRP for disposal of combustible wastes was discontinued in 1973 at which time the excavation was filled with inert debris and covered with soil.

The KRP consists of a general disposal area, semicircular in shape, measuring approximately 300 ft long, 50 to 135 ft wide, and having an area of approximately 1.5 acres. Individual rubble piles within the area range from 2 to 6 ft high. Total volume of waste is estimated to be roughly 2800 yd^3. Records indicating composition, origin, and use of disposed materials were not kept for this unit

during its period of operation. However, a thorough field inspection of the KRP revealed that it is composed primarily of soil matter. The only foreign material evident was some broken asphalt, broken concrete pieces, gravel-size coal, and two black hoses that were lying exposed on top of the ground.

Field characterization activities, conducted in 1996 and 1997, provided detailed information about the type and extent of contaminants present in soil and groundwater at the KBRP and KRP. The results are recorded in the RCRA Facility Investigation/Remedial Investigation/Baseline Risk Assessment Report (BRA) and indicate that there are low level contaminants present which pose a potential hazard to future industrial workers. The KBRP and KRP waste units have been designated for future industrial land use due to its close proximity to the K-Area Reactor Facility. Residential or agricultural use of the area will be prohibited.

The final human health constituents of concern (COCs) of future industrial worker requiring remediation for the soils are polycyclic aromatic hydrocarbons (PAHs) and arsenic (KRP only). The human health COCs to be remediated for shallow groundwater in the upper portion of the water table aquifer are tetrachloroethene (PCE) and trichloroethene (TCE). The RFI/RI/BRA determined that there are no final COCs in the soil that represent a threat to groundwater quality, that sources have been depleted, and that contaminants are no longer being released to groundwater. There are no ecological COCs.

Remedial Action

Remedial goals have been established for the KBRP/KRP based on protection of future industrial workers, and remedial action objectives (RAOs) have been established for remediation. The RAOs are to:

- Protect future industrial workers from unacceptable exposures to PAHs in soil at the KBRP

- Protect future industrial workers from unacceptable exposure to PAHs and arsenic in soil at the KRP

- Protect future industrial workers from unacceptable exposures to TCE and PCE in groundwater

- Prevent further degradation of and return groundwater to below MCLs to allow beneficial uses

An evaluation of potential alternatives was performed in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Based on this evaluation, the selected alternatives for remediating the various waste units and media are:

K-Area Burning/Rubble Pit and Rubble Pile	Soil Cover over the KBRP and KRP with Institutional Controls.
K-Area Water Table Aquifer	Monitored Natural Attenuation

The selected soil remediation for both the pit and pile is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. Even though the soil remedy does not satisfy the statutory preference for treatment, it is the only practicable remedy because there is no discernible contaminant source, there is no principal threat source material, and the waste represents only a low level threat.

The selected groundwater remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, is cost-effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. This remedy also satisfies the statutory preference for treatment as a principal element of the remedy (i.e., reduce the toxicity, mobility, or volume of materials comprising principal threats through treatment).

Institutional controls will be an integral part of the selected remedies mentioned above. Institutional controls implemented at the site will consist of future land-use restrictions and access controls such as signs. Per the US EPA-Region IV LUC Policy, a LUCAP for SRS has been developed and submitted to the regulators for their approval. In addition, a LUCIP for the KBRP/KRP OU will be developed and submitted to the regulators for their approval with the post-ROD documentation. The LUCIP will detail how SRS will implement, maintain, and monitor the LUC elements of the KBRP/KRP OU preferred alternative to ensure that the remedies remain protective of human health and the environment. Because these remedies will result in hazardous substances remaining onsite above levels that allow for unlimited use and unrestricted exposure, a review will be conducted within five years after initiation of remedial actions to ensure that the remedies continue to provide adequate protection of human health and the environment.

APPENDIX C

K-AREA BURNING/RUBBLE PIT AND RUBBLE PILE CONFIRMATORY SAMPLING PLAN

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Remedial Action Confirmatory Sampling and Analysis Plan for the K-Area Burning/Rubble Pit (131-K) and Rubble Pile (631-20G) Operable Unit (U)

WSRC-RP-2001-4022

Revision 1

June 2001

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

ADS	Ana tical Development Section
COC	Chain of Custody
CAB	Citizens Advisory Board
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CMS	Corrective Measures Study
DQO	Data Quality Objective
EMS	Environmental Monitoring Section
EPA	United States Environmental Protection Agency
ESC	Expedited Site Characterization
FFA	Federal Facility Agreement
FOM	Field Operations Manager
FS	Feasibility Study
GEL	General Engineering Laboratories
IDW	Investigation Derived Waste
KBRP/KRP	K-Area Burning/Rubble Pit, Rubble Pile
kg	Kilogram
MCL	Maximum Contaminant Level
NCP	National Oil and Hazardous Substances Contingency Plan
OU	Operable Unit
PAH	Polycyclic aromatic hydrocarbon
PM	Project Manager
ppb	Parts per billion
PP	Proposed Plan
PPE	Personal Protective Equipment
QA	Quality Assurance
QAO	Quality Assurance Officer
QAPjP	Quality Assurance Project Plan
QAP	Quality Assurance Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RCO	Radiological Control Operations
RFI/RI/BRA	RCRA Facility Investigation/Remedial Investigation/Baseline Risk Assessment Combined Report

ROD	Record of Decision
SAP	Sampling and Analysis Plan
SB	Statement of Basis
SCDHEC	South Carolina Department of Health and Environmental Control
SRS	Savannah River Site
SVOC	Semi Volatile Organic Compound
TAL	Target Analyte List
TCL	Target Compound List
TM	Task Manager
ug	Micrograms
WSRC	Westinghouse Savannah River Company

1.0 INTRODUCTION

The Fede Facility Agreement (FFA) he Savannah River Site (SRS) lists the K-Area Burning/Rubble Pit (KBRP) and Rubble Pi (KRP) Operable Unit (OU) as a Resource Conservation and Recovery Act (RCRA)/Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) unit. In July of 2000, A Record of Decision Remedial Alternative Selection for the K-Area Burning/Rubble Pit (131-K) and Rubble Pile (631-20G) Operable Unit (U) was issued. The remedial choice for the unit consists of grading portions of the OU a d placing a soil cover over the waste unit. Confirmatory sampling of the surficial soil is required in the graded areas to measure for concentrations of semi-volatile organic compounds (SVOCs) (polycyclic aromatic hydrocarbons (PAHs) and arsenic. The purpose of this Sampling and Analysis Plan (SAP) is to detail the confirmatory sampling activities.

1.1 Objectives

The objec of the work described in this Sampling a Analysis Plan (SAP) is to collect surficial soil data in he KBRP/KRP waste unit from the graded areas. The sampling will evaluate the effective moval of existing surficial contaminants during grading. The contaminan of concern are SVOCs (PAHs) and arsenic. The confirmatory mpling is required as stated in Record of Decision Remedial Alternative Selection for the K-Area Burning/Rubble Pit (131-K) and Rubble Pile (631-20G) Operable Unit (U), July 2000:

Prior to placement of a soil cover over the KBRP/KRP OU, trees and brush will be cleared and grubbed and six inches of soil removed outside of the cover area. Engineered efforts will be utilized to minimize the footprint (total acreage) of the soil cover. Isolated rubble piles, where sampling and analysis indicated no contamination above remedial goals, will be used as fill material. Th resultant surface area will be verified as clean by confirmatory sampling, graded, and vegetated.

The KBRP/KRP OU location in relation to the major SRS facilities is shown in Figure 1. Details of the KBRP/KRP OU are presented in Figure 2.

1.2 Scope

The scope of the investigation described in this SAP includes: (1) the use of hand auger to obtain soil samples from the graded portions of the OU; (2) the use of er sampling techniqu and documentation, and (3) establishing guidelines r determining confirmatory sampling is complete.

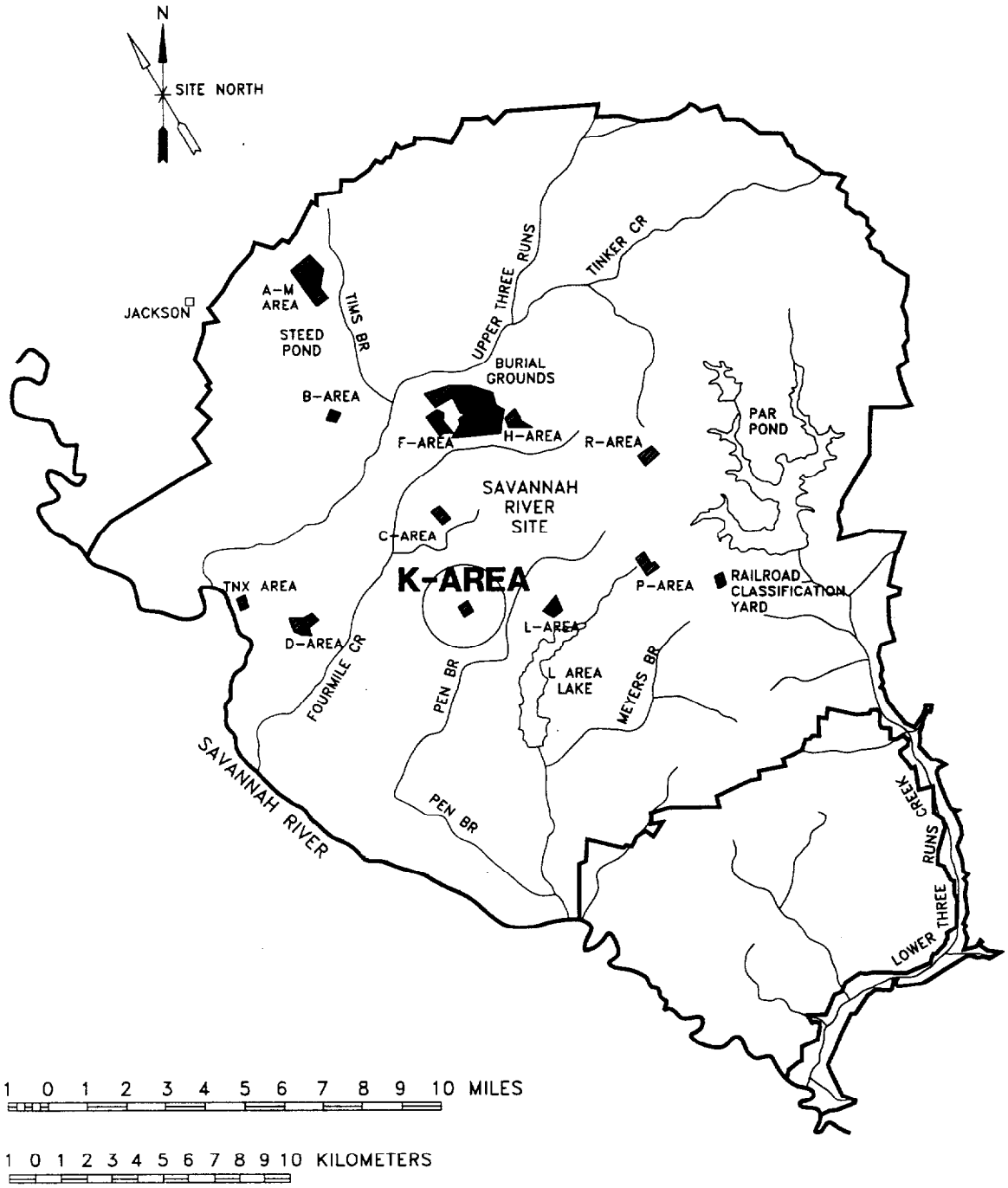

Figure 1. Location of K-Area

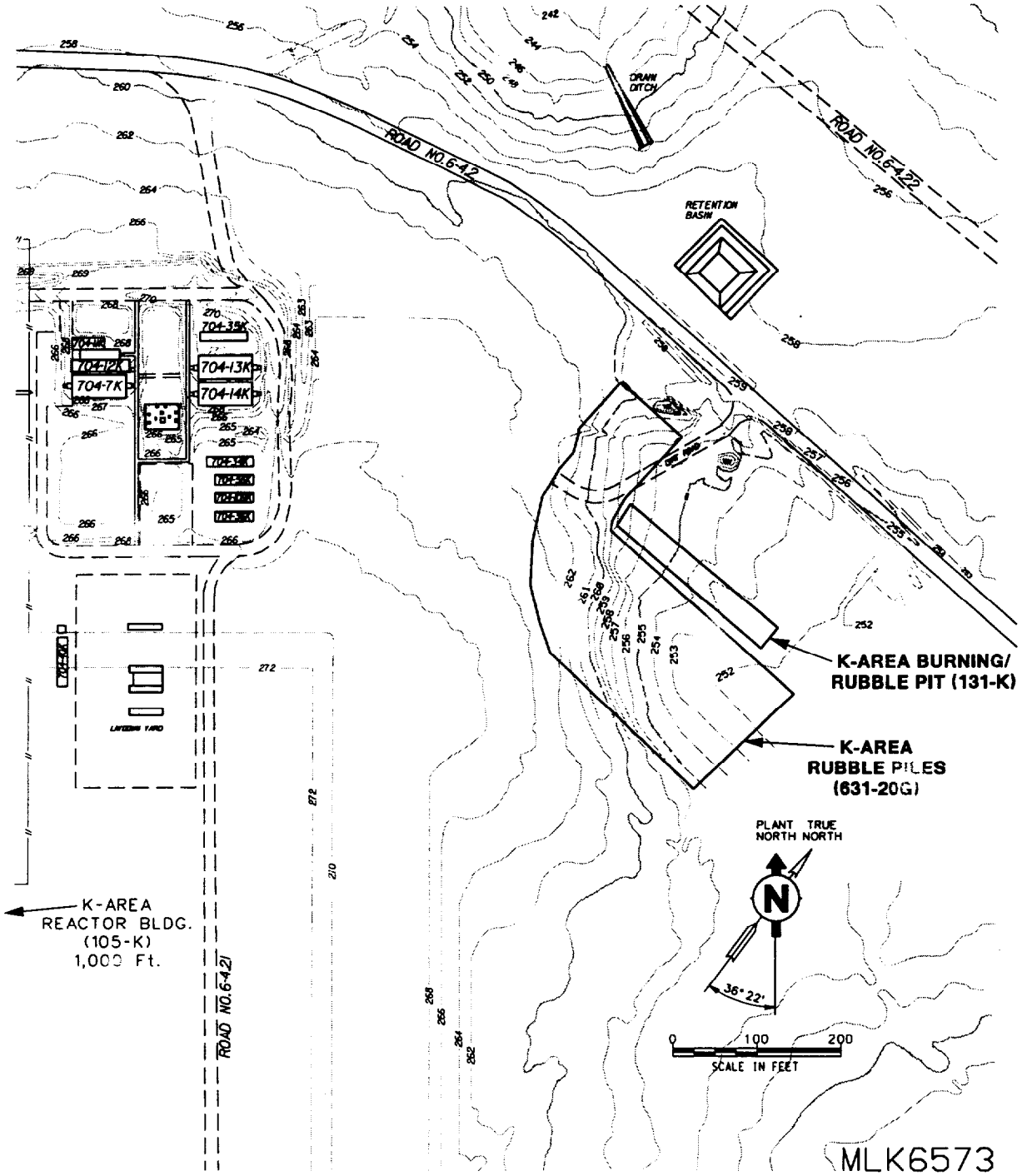

Figure 2. K-Area Burning Rubble Pit/Rubble Pile

2.0 BACKGROUND INFORMATION

2.1 Unit Description

Historical photographs of K Area indicate that the KBRP was constructed in 1955-1956 as a shallow, unlined excavation measuring approximately 9 m (30 ft) wide, 73 m (240 ft) long, and approximately 2.4 m (8 ft) deep, for waste burning and burial. Based on these dimensions, total pit volume is approximately 1,640 m^3 (2,140 yd^3) and encompasses an area of approximately 0.07 ha (0.17 acres). During operation, organic liquids of unknown use and origin, waste oils, paper, plastics, and rubber were disposed of in the pit and burned periodically. Disposal records, including composition, origin, and use of materials disposed, were not kept for this unit during its period of operation. The use of the KBRP for disposal of combustible wastes was discontinued in 1973. When the pit became full with disposed wastes, it was backfilled with soil to grade level.

Historical photographs of K Area indicate that the KRP was constructed sometime between 1956 and 1961. The KRP consists of a general disposal area, semicircular in shape, measuring approximately 91 m (300 ft) long and 15 to 41 m (50 to 135 ft) wide, and having an area of approximately 0.6 ha (1.5 acres). Individual rubble piles within the area are 1.2 to 1.8 m (4 to 6 ft) high. Total estimated waste volume is 2,140 m^3 (2,800 yd^3). The KRP is composed primarily of soil matter, with some broken asphalt, broken concrete pieces, and gravel-sized coal. The coal and asphalt exist in a wide range of particle sizes and are dispersed in a highly heterogeneous manner throughout the piles. Disposal records were not kept for this unit during its period of operation.

KBRP/KRP OU is located within the Pen Branch Watershed. Surface drainage in the study area is to the east-southeast, discharging into an unnamed tributary and eventually entering Pen Branch approximately 1.6 km (1 mi) from the units. Surface water from Pen Branch ultimately discharges into the Savannah River, located approximately 11 km (7 mi) southwest of the study area.

An RFI/RI characterization and Baseline Risk Assessment (BRA) were conducted for the unit during 1996 and 1997. The results of the RFI/RI and BRA are presented in the RFI/RI/BRA (WSRC 1998b).

Prior to the submittal of the CMS/FS for the KBRP/KRP OU, the SRS Environmental Restoration Department presented a focused feasibility scoping of remedial actions for the KBRP/KRP to the Environmental Remediation and Waste Management Subcommittee of the SRS Citizens Advisory Board (CAB). This feasibility scoping was deemed necessary since the risk associated with KBRP/KRP OU requires that a remedial action be performed in a timely manner.

In July 2000, a Record of Decision (ROD) presented a decision document of the selected remedial alternatives for the KBRP/KRP OU. The selected alternatives were developed in accordance with CERCLA, as amended by the Superfund Amendments and Reauthorization Act and, to the extent practicable, the National Oil and Hazardous Substances Contingency Plan (NCP).

KBRP Soil

Contaminants of concern for the remedial action found in the KBRP were polycyclic aromatic hydrocarbons(PAHs) (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-c,3)pyrene). The nature of PAH contamination indicates that the KBRP is a source of PAHs. PAHs are a group of semivolatiles that are formed by incomplete burning of organic materials (e.g., coal, oil, gas, garbage, wood, and leaves). PAHs also are common in substances such as crude oil, coal, and coal tar pitch and in coal tar emulsions such as asphalt sealant, creosote, asphalt cements, road asphalt, roofing tar, and roofing shingles. PAHs are ubiquitous environmental pollutants since they are created from the burning of fossil fuels, are contained in common construction products, and also are created from atmospheric deposition from natural sources. In addition, PAHs that were rapidly buried and preserved are known to be present in the geologic record in lacustrine and coastal marine sediments that are millions of years old.

KRP Soil

Contaminants of concern for the remedial action found in the KRP were PAHs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-c,3)pyrene) and arsenic. No final contaminant migration (CM) COCs were identified for the KBRP or KRP from soil leachability models. The results of the contaminant fate and transport analysis did not indicate any constituents with the potential to leach to groundwater in concentrations above the maximum acceptable limits.

3.0 DATA QUALITY OBJECTIVES

The Data Quality Objectives (DQOs) for the KBRP Confirmatory Sampling represent the types and minimum level of data analysis needed for characterization at this unit. The objective of this sampling plan is to confirm the removal of PAHs and arsenic from the surficial soils at the KBRP/KRP OU.

According to the United States Environmental Protection Agency (EPA540-R-93-071, September 1993), "The DQO process was developed by EPA to help Agency personnel collect data that are important to decision making. The process allows decision-makers to define their data requirements and acceptable levels of decision errors during planning, before any data are collected. Application

of the DQO process should result in data collection designs that will yield results of appropriate quality for defensible decision making". The DQO process is a seven-step method designed to ensure that the appropriate type, quantity, and quality of environmental data are collected for the intended application. Table 1 presents the DQOs developed for the KBRP/KRP confirmatory Sampling. The specific analytes and analytical methods for the project are listed in Table 2.

Data quality levels will be screening level with definitive confirmation (WSRC 1996).

Table 1. Data Quality Objectives for the KBRP/KRP OU Remedial Action Confirmatory Sampling

Pathway (Media)	Probable Conditions	Exposure Pathway and/or Release Mechanisms	Data Needs and DQOs Including Engineering / Physical Processes	Field Activities Including Removal and Characterization	Parameters	Potential Remedial Action Alternatives
Soil	Contamination of soil from leaching and spills from primary sources	Dermal contact with soil. Inhalation, Ingestion.	Collect soil samples for laboratory analysis to verify effectiveness of site grading in removing surficial contamination at the site.	Collect soil samples using hand auger for laboratory analysis to determine effectiveness of site grading on removing surficial contamination at the site. See Table 3 remediation goals for arsenic and PAHs	Arsenic, benzo(a)anthracene, benzo(a)pyrene, benzo(b)flouranthene, indeno(1,2,3-cd)pyrene	Consolidating the soil / rubble into one area and capping with a soil cover. Verification that the RG's have been met in the areas where soil removal has been performed.

Table 2. Analytical Parameters for Soil Sample

Target Analyte List Metals

Analyte	Testcode	CAS #	EPA Method	MDL (µg/kg)
Arsenic, total recoverable	ASTOT	7440-38-2	EPA6010B	1110

Semi-Volatile Organic Compounds

Analyte	Testcode	CAS #	Method	MDL (µg/kg)
Benzo[a]anthracene	BAANTR	56-55-3	EPA8270C	29.4
Benzo[b]fluoranthene	BBFANT	205-99-2	EPA8270C	55.3
Benzo[a]pyrene	BAPYR	50-32-8	EPA8270C	25.5
Indeno[1,2,3-c,d]pyrene	ICDPYR	193-39-5	EPA8270C	30

Table 3. Constituents of Concern, Risks to Future Industrial Workers, and Remedial Goals for K-Area Burning/Rubble Pit and Rubble Pile Operable Unit

Unit	COCs	Basis/Receptor	Baseline Risk	Remedial Goals (for 10^{-6} or HQ=0.1)
KRP Soil	benzo(a)anthracene	Future Industrial Worker	1.81×10^{-5}*	6.24 mg/kg[a]
	benzo(a)pyrene		1.45×10^{-4}*	0.624 mg/kg[a]
	benzo(b)fluoranthene		2.30×10^{-5}*	6.24 mg/kg[a]
	indeno(1,2,3-c,d)pyrene		8.70×10^{-6}*	6.24 mg/kg[a]
	arsenic		3.35×10^{-5}*	7.96 mg/kg[c]

* Combines ingestion, inhalation, and dermal contact based on potential exposure to soil in the 0- to 1-foot interval.
**Risk based on potential exposure (ingestion) of groundwater.

a The remedial goal is based on the 1×10^{-6} target cancer risk to the hypothetical, future, industrial worker.

b The remedial goal is based on the Water Quality Protection of Human Health as established by South Carolina Regulation 61-68 of the Pollution Control Act.

c The remedial goal is based on two times the mean concentration of arsenic in background soil at the KBRP and KRP.

mg/kg = milligrams per kilogram
µg/L = micrograms per liter
mg/L = milligrams per liter

4.0 FIELD SAMPLING PLAN AND REQUIREMENTS

SVOCs (PAHs) and Metals (Arsenic) are the indicators for soil contamination because previous investigations determined that these are the COCs in the surficial soil at KBRP/KRP OU.

The plan proposes to collect a total of 15 hand auger soil samples and QC samples (Table 4) in the graded portion of the KBRP/KRP OU. Samples are to be collected in the region, outside the soil cover, which is cleared and graded. The proposed, approximate sample locations are shown in Figure 3. The actual sampling locations may vary depending on field conditions after grading. The STR must approve of sampling locations prior to sampling and be notified 48 hours prior to the sampling event.

The TO shall perform sample collection in accordance with WSRC Manual 3Q5, Chapter 16, Rev. 2. At each location soil samples will be collected using a hand auger from 0-1 foot below land surface (bls). The sample will be placed in a stainless steel mixing bowl to be composited with a stainless steel spoon. Once thoroughly mixed, sample aliquots will be placed in the appropriate laboratory containers for processing and shipping to the laboratory for analysis.

Samples will be analyzed for the COC's as listed in Table 2. The data will then be screened against the Remedial Goals listed in Table 3. This information must be transmitted to the BSRI technical staff as soon as possible for determining if additional excavation is required. After soil removal and verification sampling is complete, the region being evaluated must be barricaded and remain undisturbed until the sample data has been evaluated by BSRI. The "Cap" will not be installed until all of the excavated areas have been sampled and the data evaluated by BSRI.

If one or more of the samples exceed the remedial goals, additional soil will be removed in the immediate area of the sample locations. The BSRI technical staff will determine the actual area for additional soil removal. After the soil is removed additional samples will be collected, and the process will be repeated until the area is determined to be clean.

Samples will be recorded in Environmental Monitoring Section (EMS) red sample logbooks. All communication with the laboratory will be based on the EMS red sample book sample number.

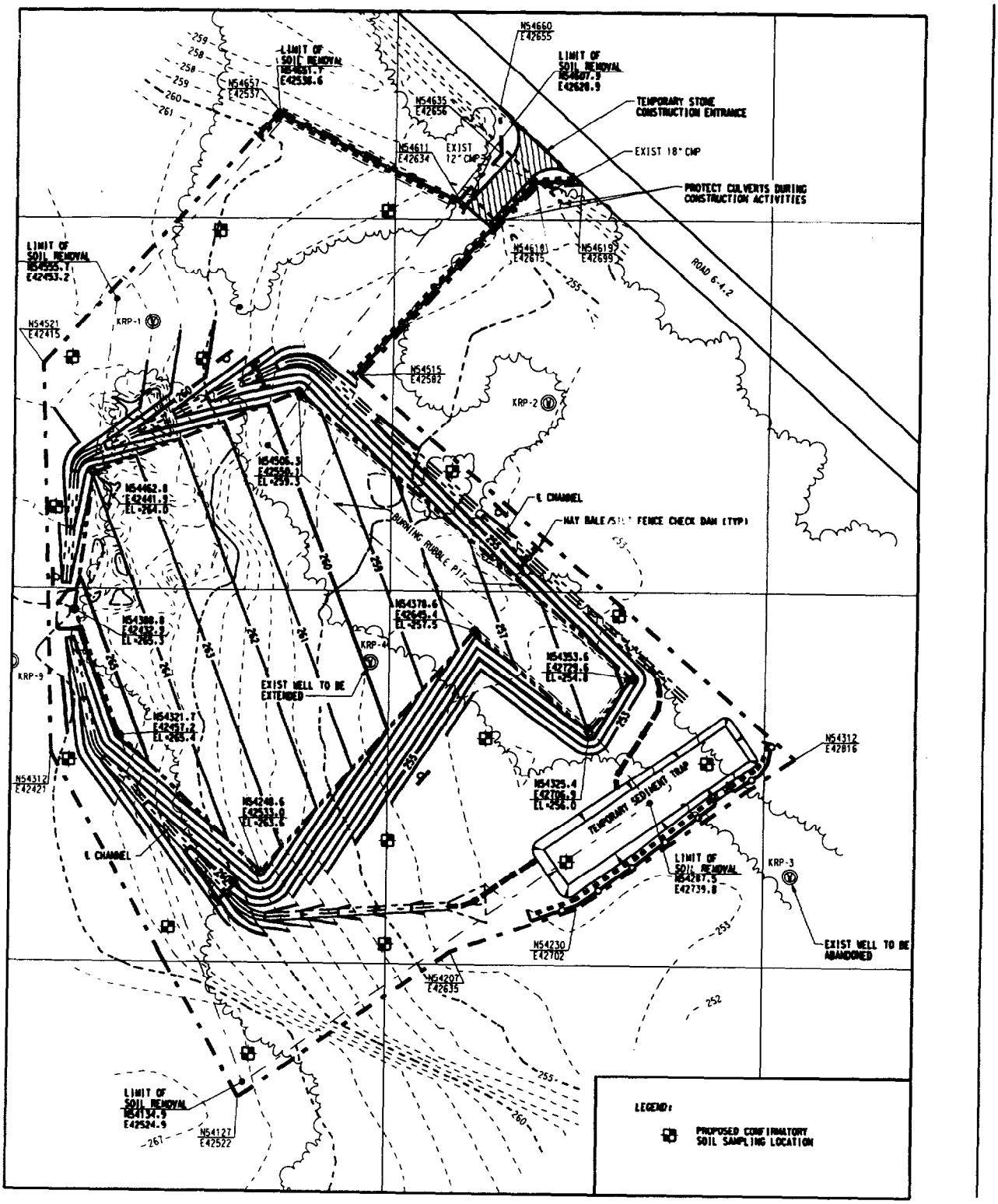

Figure 3. Proposed Soil Sampling Locations at the KBRP/KRP OU

Table 4. KBRP/KRP Sampling Matrix

Matrix	Facility ID	Group ID	Location ID	Sample Number !	**	Sample Tool	Sample Type	Sample Location	Sampling Interval (ft bls) Top	Bottom	Analyte Suite	Sample Hierarchy	
Soils Outside the Cap Area													
	Soil Samples												
soil	KBRP	OC	01	01		Hand Auger	Soil	Area Outside of Cover	0.0	1.0	1,2	1	
soil	KBRP	OC	02	01		Hand Auger	Soil	Area Outside of Cover	0.0	1.0	1,2	1	
soil	KBRP	OC	03	01		Hand Auger	Soil	Area Outside of Cover	0.0	1.0	1,2	1	
soil	KBRP	OC	04	01		Hand Auger	Soil	Area Outside of Cover	0.0	1.0	1,2	1	
soil	KBRP	OC	05	01		Hand Auger	Soil	Area Outside of Cover	0.0	1.0	1,2	1	
	*	*	*	*									
soil	KBRP	OC	TBD	01		Hand Auger	Soil	Area Outside of Cover	0.0	1.0	1,2	1	
soil	KBRP	OC	01	02		Hand Auger	Soil	Area Outside of Cover	0.0	1.0	1,2	2	
soil	KBRP	OC	02	02		Hand Auger	Soil	Area Outside of Cover	0.0	1.0	1,2	2	
soil	KBRP	OC	03	02		Hand Auger	Soil	Area Outside of Cover	0.0	1.0	1,2	2	
soil	KBRP	OC	04	02		Hand Auger	Soil	Area Outside of Cover	0.0	1.0	1,2	2	
soil	KBRP	OC	05	02		Hand Auger	Soil	Area Outside of Cover	0.0	1.0	1,2	2	
	*	*	*	*									
soil	KBRP	OC	TBD	02		Hand Auger	Soil	Area Outside of Cover	0.0	1.0	1,2	2	

ANALYTE CODE

Soils	Water	
1	101	TAL Inorganics
2	102	TCL Semi-Volatiles

OC SAMPLE CODE:

A-Duplicate Sample
B- Trip Blank
C-Field Blank
D-Split Sample
E-Rinsate

NOTES:

* The same numbering pattern is to be used - adding contingent samples as required.

! For each sample location, the sample number increases with the number of contingent samples required.

** QC Sample Code
The proper number of QC samples are to be collected and numbered in the field, based on:
1 Duplicate per 20 samples
1 Split per 20 samples
1 Field Blank per 20 samples
1 Rinsate per 20 samples
1 Trip blanks per cooler.

SAMPLE HIERARCHY:

1-Required / Screening with Definitive Confirmation
2-Contingent / Screening with Definitive Confirmation

Essential field information includes sample identification, date of collection, time of collection, depth of sample, samplers' name, weather and relative diagram of the sample stations. Space has been provided for any field observations or comments relating to the quality or representativeness of the sample. Information on field duplicates' parent sample should be recorded.

A chain of custody (COC) record shall be maintained to document the possession of samples from the time they are obtained until received by contract laboratory personnel. The record will consist of the following information:

- Project name and number
- Signature of sampler(s)
- Sample identification number
- Sampling date and time
- Composite designation
- Sample type
- Sampling location
- Number of containers per sample
- Remarks or comments
- Signature of the Project Manager or designee
- Signatures of the person relinquishing the sample, the person receiving the sample, and the date and time the transfer occurred

An original COC form will accompany each shipment transmitted to the contract laboratory. The form will be placed in a plastic bag and placed inside the shipping container. The original COC record will be returned to the STR after the laboratory receives the samples. Any unused COC forms are to be marked "not sampled" and returned, along with the EMS red sample logbook to the STR. (Reference WSRC 3Q Environmental Compliance Procedure 21.1 Sample Chain of Custody, Revision 0, December 4, 1995.)

The planned sampling will generate aqueous and solid investigation derived waste (IDW). The aqueous IDW will consist of decontamination rinsates. The decontamination rinsates and excess soil will be discharged to the ground.

Project personnel must be HAZWOPPER trained and meet the requirements for Technical Oversight (relevant to soil sampling) specified in WSRC Manual 3Q5, Chapter 4 Rev. 2. In addition, the Technical Oversight (TO) shall have a minimum of 1-year experience in characterization soil sampling methods (similar to those specified in WSRC Manual 3Q5 and the sampling plan).

All sample collection and process tools (hand auger, scoops, bowls spoons etc) are to be stainless steel. Decontamination shall be conducted in accordance with WSRC Manual 3Q5, Chapter 4 Rev2. Pesticide-grade isopropanol is to be used for the alcohol rinse portion of decontamination process.

A South Carolina DHEC Certified Laboratory shall perform all analysis. Sample analysis shall be performed according to SW-846 Update III methods. Verification and Validation is to be performed by the subcontractor. Data is to be validated as screening data with definitive confirmation. Reference: 'Environmental Geochemistry Group Operating Handbook'; Sections 1.800 and 1.801. WSRC 3Q Manual; Procedure 21.1 and Procedure 21.3.

The subcontractor shall deliver sample results electronically as an Excel file. The Excel file shall be in AN98 format and include in the following order WSRC ID, Field QC Code, Event Code, COC #, Sample ID, Sample Date, Sample Time, Lab Receipt, Extraction Date, Extraction Time, Prep Method, Analysis Date, Analysis Time, Method, Prep Batch, Lab, Lab Sample ID, Lab Rep, Testcode, Det. Limit, ssEQL, EPA FG Code, Storet Code, EMS Code, Result, Units, Accuracy, Res. Weight, Nom. Conc., % Recovery, L.A.L., U.A.L, Wet/Dry Weight, Dilution Factor, Instrument, Batch, Analyst, % Solids, Bottle Label, Sample Fraction, Matrix, Prep Factor, Contract number. This format can be provided to the subcontractor laboratory if necessary and is referenced in 'Environmental Geochemistry Group Operating Handbook'; Section 1.801. WSRC 3Q Manual; Procedure 21.1 and Procedure 21.3.

All sampling locations are required to be surveyed and reported electronically in Excel file format either prior to or after sampling.

5.0 QUALITY ASSURANCE PROJECT PLAN (QAPJP)

WSRC Procedure Quality Assurance Plan (QAP) 21-1, "Quality Assurance Requirements for the Collection and Evaluation of Environmental Data" establishes quality assurance requirements and responsibilities for environmental data collection and evaluation activities. This SAP is designed to comply with QAP 21-1 guidelines. A total of 16 elements for a Quality Assurance Project Plan (QAPjP) are called for under this SRS site guidance and has been modified to 12 items that are appropriate to this activity. Each of these are addressed below. If the element has been previously addressed elsewhere in this document the appropriate section is referenced.

5.1 Project Description

A brief description of the project and its objectives are provided in Section 1.

5.2 Project Organization and Responsibility

The subcontractor Field Operations Manager (FOM) will be the point of contact, and will be responsible for active participation in the implementation of this SAP. The FOM reports directly to the subcontractor Task Manager (TM). The TM will provide technical assistance as required, and will ensure that adequately qualified personnel and necessary equipment are available to complete the task in a timely manner.

The subcontractor Quality Assurance Officer (QAO) will be responsible for review of the data, results, and Quality Control (QC) information obtained throughout the project. Any discrepancies or deviations from the Quality Assurance/Quality Control (QA/QC) plan will be brought to the attention of the TM in written communication with copies to the subcontractor Program Manager (PM), WSRC Project Manager, and the project file. Corrective action to be taken will be prepared by the TM and approved by the subcontractor QAO. The subcontractor QAO is responsible directly to the PM through a management structure independent of technical management. The TM retains ultimate responsibility for all technical and QA/QC aspects of the project. The TM has the authority to mobilize the technical expertise and resources necessary to ensure successful completion of the project.

5.3 Data Quality Objectives

DQOs are presented in Section 3 and Table 1.

5.4 Sample Collection, Control, and Transport

Sampling procedures, locations, equipment, and sample preservation are provided in Section 4. Sampling will be in accordance with WSRC Manual 3Q5.

5.5 Sample Custody

COC procedures for field sampling operations are presented in Section 4.0. Laboratory operations shall be in accordance with approved quality assurance procedures of the contract laboratory.

5.6 Analytical Procedures

The applicable standard operating procedure for each measurement parameter is provided in Table 2.

5.7 Internal Quality Control Checks

Each subcontractor associated with this project has in place a Quality Assurance Program Plan approved by WSRC that provides internal quality control checks on that subcontractor's work.

5.8 Performance Assessments

A performance assessment will be conducted at least once during field activities by the technical oversight subcontractor QAO or his designee to determine if the field procedures conform to the procedures specified in the contract. This assessment is a check for the adequacy and effectiveness of the operating procedures, COC, and documentation utilized by the field personnel. Non-compliances will be logged, documented, and controlled through assessment findings, which are attached to and become a part of the internal assessment report. These assessment findings will be directed to the appropriate supervisor for corrective action in a specified and timely manner.

5.9 Data Precision, Accuracy, and Completeness

The analytical data resulting from the characterization will be reviewed for precision by comparing replicate samples and original samples for consistency and repeatability of the chemical analyses. Accuracy will be assessed by preparing known standards for analysis and comparing the data to the known values. The analytical data will also be reviewed for laboratory contamination and analytical carry-over between samples by comparing the actual analysis of a blank with the reported values.

Quality control samples will consist of a sample duplicate, field blank and a rinsate blank.

5.10 Corrective Action

When a significant condition adverse to quality is noted, the cause of the condition will be determined and corrective action will be taken to preclude repetition of the same condition. Condition identification and cause, documents affected, and corrective action will be documented and reported to the TM. Implementation of corrective action will be verified by documented follow-up action. All task personnel have the responsibility, as part of the normal work duties, to promptly identify and report conditions adverse to quality. Nonconforming items or services will be documented on an Nonconformance Report Form and processed in accordance with the field oversight subcontractor Quality Assurance Administrative Procedure.

5.11 Reports to Management

Periodic QA reports will be submitted to apprise the TM of the QA status of measurement systems and data quality, and to identify problem areas and potential trends ascertained during audits.

5.12 Project Documentation/Records

A red logbook for recording sample collection activities will be provided by EMS. The subcontractor TM will ensure the logbook is correctly filled out and returned to EMS within two weeks after completion of sampling. The red sample books provide numeric sample numbers which should be used for all communication with the offsite lab, the Analytical Development Section (ADS), and the Radiological Control Operations (RCO). Essential field information are: sample name, date of collection, time of collection, depth of sample and sampler's name. Space has been provided for any field observations or comments relating to the quality or representativeness of the sample. If the actual sample location differs from the planned sample location specified by the COC, the revised sample location should be indicated in the red sample logbook. Information on the parent sample of each field duplicate should be recorded.

6.0 REFERENCES

EPA, 1993. *Data Quality Objectives Process for Superfund,* EPA 540-R-93-071, United States Environmental Protection Agency (September 1993).

WSRC, 1995. WSRC 3Q Environmental Compliance Procedure 21.1 Sample Chain of Custody, Revision 0, December 4, 1995.

WSRC, 1996. WSRC 3Q Environmental Compliance Procedure 21.3 Validation of Environmental Chemical Data, Revision 0, January 2, 1996.

WSRC, 1997b. *Hydrogeologic Data Collection Procedures and Specifications, 3Q5*, Rev. 2, Westinghouse Savannah River Company, Savannah River Site, Aiken, South Carolina (June 1997).

WSRC, 1998. 'Environmental Geochemistry Group Operating Handbook'; Sections 1.800 and 1.801. WSRC 3Q Manual; Procedure 21.1 and Procedure 21.3.

WSRC, 2000. *Record of Decision Remedial Alternative Selection for the K-Area Burning/Rubble Pit (131-K) and Rubble Pile (631-20G) Operable Unit (U)*, WSRC-RP-97-862, Rev. 1, Westinghouse Savannah River Company, Savannah River Site, Aiken, South Carolina (July 2000).

APPENDIX D

STORMWATER MANAGEMENT AND SEDIMENT REDUCTION PLAN/POLLUTION PREVENTION PLAN

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GRADING PERMIT APPLICATION FOR LAND DISTURBING ACTIVITIES AT THE SAVANNAH RIVER SITE

(FM PRO 4.0 for WINDOWS '98)

SECTION 1

DATE: 1/3/2001

FILE NUMBER: [redacted] A
[redacted] (To be assigned by EPD)

1. FACILITY NAME OR PROJECT NAME: K-Area Bruning Rubble Pit and Rubble Pile

SIZE, TOTAL (ACRES): 4.21 SURFACE AREA OF LAND DISTURBANCE (ACRES): 2.5

SRS AREA: H-Area COUNTY: Barnwell START DATE: 8/01/2001 COMPLETION DATE: 8/01/2002

LOCATION: Approximately 1 mile south of Road 6, east of K-reactor and west of the road between K-area and L-area

2. FOR LAND DISTURBANCES GREATER THAN OR EQUAL TO 5 ACRES:

SIC CODE: ______ LATITUDE: ______ LONGITUDE: ______

USGS QUADNAME: ______

3. NEAREST RECEIVING WATER BODY: Pen Branch

DISTANCE TO NEAREST RECEIVING WATER BODY: >5000 ft

ULTIMATE RECEIVING WATER BODY: "Atlantic Ocean"

LIST NPDES OUTFALLS DOWNSTREAM OF THIS ACTIVITY: none

5. ARE FRESHWATER WETLANDS LOCATED ON PROPERTY? ○ YES ◉ NO

If Yes, Have The Wetlands Been Delineated? ○ YES ◉ NO

SECTION 2

Provide Applicable Information as Requested Below: (List name, address, and phone/pager #)

6. RESPONSIBLE ORG.: Environmental Restoration

PROJECT MANAGER: T.R. Bland, 730-2B,2-6514

ENVIRONMENTAL COORD.: Price, Joe K. (2-6708, B-17718)

7. DESIGN AGENCY: PE&CD/ER

RESPONSIBLE ENGINEER: J.L. Statton,730-2B,2-8860

8. CONSTRUCTION ENGR.: N/A

SUBCONTRACT TEC. REP. (STR) : L.A. Anderson, 730-2B,2-6700,B-14471

9. CONTRACTOR: ______

RESPONSIBLE SUPT.: ______

SUBCONTRACTOR/CO-PERMITTEES: ______

SIC CODES:
15 General Building Contractors__ 1541-Industrial buildings and Warehouses
16 Heavy Const. __ 1611-Hwy and str. const.,1622-Bridge, tunnel, & elev. hwy.1623-Water sewer, and utility lines,1629 Heavy const., nec.
17 Special Trade Contractors __ 1794-Excavation work, 1795-Wrecking and demolition work

Westinghouse Savannah River Company
Environmental Protection Department
File# 01-01-K-2.5
Date Issued 1/03/01
By: [signature]

SECTION 3

10.a 12/19/2000
Environmental Coordinator Signature / Date

10.b 12/19/2000
Design Agency Rep. Signature / Date

11. I HEREBY CERTIFY THAT ALL LAND DISTURBING CONSTRUCTION AND ASSOCIATED ACTIVITY PERTAINING TO THIS SITE SHALL BE ACCOMPLISHED PURSUANT TO AND IN KEEPING WITH THE TERMS AND CONDITIONS OF THE APPROVED PLANS. I ALSO CERTIFY THAT A RESPONSIBLE PERSON WILL BE ASSIGNED TO THE PROJECT FOR DAY-TO-DAY CONTROL. I ALSO GRANT AUTHORIZATION TO THE DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL AND/OR THE IMPLEMENTING AGENCY THE RIGHT OF ACCESS TO THE SITE AT ALL TIMES FOR THE PURPOSE OF ON SITE INSPECTIONS DURING THE COURSE OF CONSTRUCTION AND TO PERFORM MAINTENANCE INSPECTIONS FOLLOWING THE COMPLETION OF THE LAND DISTURBING ACTIVITY.

Printed Name

Signature / Date

12. I HEREBY CERTIFY THAT ALL LAND DISTURBING CONSTRUCTION AND ASSOCIATED ACTIVITY PERTAINING TO THIS SITE SHALL BE ACCOMPLISHED PURSUANT TO AND IN KEEPING WITH THE TERMS AND CONDITIONS OF THE APPROVED PLANS. I ALSO CERTIFY THAT A RESPONSIBLE PERSON WILL BE ASSIGNED TO THE PROJECT FOR DAY-TO-DAY CONTROL. I CERTIFY UNDER PENALTY OF LAW THAT THIS DOCUMENT AND ALL ATTACHMENTS WERE PREPARED UNDER MY DIRECTION OR SUPERVISION IN ACCORDANCE WITH A SYSTEM DESIGNED TO ASSURE THAT QUALIFIED PERSONNEL PROPERLY GATHERED AND EVALUATED THE INFORMATION SUBMITTED. BASED ON MY INQUIRY OF THE PERSON OR PERSONS WHO MANAGE THE SYSTEM OR THOSE PERSONS DIRECTLY RESPONSIBLE FOR GATHERING THE INFORMATION, THE INFORMATION SUBMITTED IS, TO THE BEST OF MY KNOWLEDGE AND BELIEF, TRUE, ACCURATE, AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT FOR KNOWING VIOLATIONS. I ALSO GRANT AUTHORIZATION TO THE DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL AND/OR THE IMPLEMENTING AGENCY THE RIGHT OF ACCESS TO THE SITE AT ALL TIMES FOR THE PURPOSE OF ON SITE INSPECTIONS DURING THE COURSE OF CONSTRUCTION AND TO PERFORM MAINTENANCE INSPECTIONS FOLLOWING THE COMPLETION OF THE LAND DISTURBING ACTIVITY.

Paul R. Huber
Printed Name*

Paul R. Huber 1/8/01
Signature / Date

*Owner / Person Financially Responsible or Authorized Representative of DOE (corporate officer or their delegate)

13. DESIGNER CERTIFICATION: FOUR COPIES OF THE PLANS, ALL SPECIFICATIONS AND SUPPORTING CALCULATIONS, FORMS, AND REPORTS ARE HEREWITH SUBMITTED AND MADE A PART OF THIS APPLICATION. I HAVE PLACED MY SIGNATURE AND SEAL ON THE DESIGN DOCUMENT SUBMITTED SIGNIFYING THAT I ACCEPT RESPONSIBILITY FOR THE DESIGN OF THE SYSTEM. FURTHER, I CERTIFY TO THE BEST OF MY KNOWLEDGE AND BELIEF THAT THE DESIGN IS CONSISTENT WITH THE REQUIREMENTS OF TITLE 48, CHAPTER 14 OF THE CODE OF LAWS OF SC, 1976 AS AMENDED, AND PURSUANT REGULATION 72-300.

ENGINEER ☒
TIER B, LAND SURVEYOR ☐
LANDSCAPE ARCHITECT ☐

0 1 3 6 8 3
S.C. Registration Number

NO.13683

12/19/2
Signature / Date

LAND DISTURBANCE	REQUIRED SIGNATURE (S)
< 2 ACRES	ENVIRONMENTAL COORDINATOR (EC)
≥ 2 ACRES	EC, DESIGN AGENCY, & Owner or person financially responsible (Block 11)
> 2 ACRES	EC, OWNER/PERSON FINANCIALLY RESPONSIBLE (BLOCK 12)
	DESIGNER CERTIFICATION (BLOCK 13)

GRADING PERMIT APPLICATION FOR LAND DISTURBING ACTIVITIES AT THE SAVANNAH RIVER SITE

(FM PRO 4.0 for WINDOWS '98)

SECTION 4

FOR INTERNAL USE ONLY:

1. I HEREBY CERTIFY THAT I HAVE THOROUGHLY REVIEWED THE APPLICATION, PLANS AND SUPPORTING DOCUMENTS AND FOUND THEM TO BE IN COMPLIANCE WITH THE LETTER AND THE INTENT OF THE LAW. THIS STAMP OF APPROVAL ON THE PLANS IS SOLELY AN ACKNOWLEDGEMENT OF SATISFACTORY COMPLIANCE WITH THE REQUIREMENTS OF THESE REGULATIONS. THE APPROVAL STAMP DOES NOT CONSTITUTE A REPRESENTATION OF WARRANTY TO THE APPLICANT OR ANY OTHER PERSON CONCERNING THE SAFETY, APPROPRIATENESS OF EFFECTIVENESS OF ANY PROVISIONS, OR OMISSION FROM THE STORMWATER AND SEDIMENT PLAN. I HAVE STAMPED 2 SETS OF APPROVED PLANS.

   I HAVE FILED ONE SET AND DISTRIBUTED ☒ Grading Permit Application only to SCDHEC - Aiken, SC

   R. L. G 1/3/01
   PLAN REVIEWER

2. WILL AS BUILT CERTIFICATION BY A REGISTERED PROFESSIONAL RESPONSIBLE FOR CONSTRUCTION BE REQUIRED FOR THIS PROJECT FOR FINAL APPROVAL?
   (To be specified by reviewer)

   ☐ YES ☒ NO

   IF YES

   PRIOR TO FINAL APPROVAL, I WILL SUBMIT A STATEMENT CERTIFYING THAT CONSTRUCTION IS COMPLETE AND IN ACCORDANCE WITH APPROVED PLANS AND SPECIFICATIONS. THIS WILL BE BASED UPON PERIODIC OBSERVATIONS OF CONSTRUCTION AND FINAL INSPECTION FOR DESIGN COMPLIANCE BY ME OR A REPRESENTATIVE OF MY OFFICE WHO IS UNDER MY SUPERVISION.
   (To be signed by a registered professional responsible for construction)

   _____
   SIGNATURE / DATE

3. Records: Please ensure that this document is included with the official Project Files and is handled per SCD4 requirements. EPD will maintain "Information Only" copies of this document.

STORMWATER MANAGEMENT & SEDIMENT REDUCTION PLAN/POLLUTION PREVENTION PLAN (SMSRP/PPP)

K-AREA BURNING/RUBBLE PIT AND RUBBLE PILE (KBRP/RP)

C-ERP-K-00002

REVISION 0

Westinghouse Savannah River Company
Environmental Protection Department

CA-1219

File# 01-01-K-2.5
Date Issued 1/3/01
By: [signature]

Originator	J. L. Statton	Date: 11-27-2000
Verifier/ Checker	S. M. Mead	Date: 12-1-2000
Approval	M. K. Patel	Date: 12/13/2000
Approval	W. N. Kennedy	Date: 12-14-00

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER NO. 13683 MAHESH KUMAR K. PATEL

12/13/00

SUMMARY OF REVISIONS

Revision	Revision Date	Affected Sections and Paragraphs	Description of Change
0	10/27/2000	All.	Issued for construction.

1.0 PROJECT DESCRIPTION

The K-Area Burning/Rubble Pit and Rubble Pile (KBRP/RP) project consists of the following:

- Site work including earthwork, clearing, and grubbing.
- Vegetation removal.
- Removal of contaminated soil and placement in the soil cover area.
- Soil backfill in the KBRP/RP soil excavation area.
- Placement of a soil cover over the KBRP/RP contaminated soil.
- Maintenance of gravel paving over the gravel entrance.
- Site fill, grading, and vegetation.

The KBRP/RP is located outside the perimeter fence to the east of the K-Reactor. The project site is a 4.21-acre area with slightly more than half of the area as a meadow area with the remainder of the project site lightly wooded. The proposed area of disturbance is approximately 2.5 acres.

The disturbed area encompasses the following areas:

- Vegetation removal area and KBRP/RP soil removal (1.1 acres)
- KBRP/RP cover (1.4 acres)

2.0 PROJECT SCHEDULE

The project is anticipated to begin in October 2001.

Activity	Anticipated Duration
Tree removal	30 days
Clearing and grubbing	30 days
Soil removal and soil cover construction (including seeding and mulching)	120 days

3.0 EXISTING CONDITION AND HISTORICAL INFORMATION

The KBRP was constructed in 1955-1956 as a shallow unlined excavation measuring approximately 30 feet wide, 240 feet long, and approximately 8 feet deep. Organic liquids of unknown use and origin, waste oils, paper, plastics, and rubber were disposed in the pit and burned periodically. Disposal of ignitable wastes in the pit was discontinued in 1973 and the pit is presently inactive.

The K-Area Rubble Pile (KRP) was constructed sometime between 1956 and 1961. The KRP is located adjacent to the KBRP and was used for the disposal of inert rubble from the initial construction of the K-Area Reactor. The KRP consists of a general disposal area semicircular in shape. The KRP measures approximately 300 feet long and 50 to 135 feet wide and encompasses an area of approximately 1.5 acres. Individual rubble piles within the area are 4 to 6 feet high.

The KBRP/RP area is primarily a lightly wooded area. The surrounding meadow areas drain into the KBRP/RP area. The soil in the area is primarily Udorthents soils with Dothan, both Soil type B.

4.0 EROSION AND SEDIMENT CONTROL MEASURES

Temporary measures indicated on the attached drawings including temporary seeding, silt fence/hay bale barriers, temporary earth berms, and a sediment trap at the end of north and south channels that will be maintained throughout the construction activities. A sediment trap will capture sediments from concentrated flow of the disturbed area. Attempts to revegetate will begin immediately after each phase has been implemented. Temporary stormwater management and sediment control measures will be inspected and maintained until stabilization of the disturbed areas is confirmed. Permanent erosion control measures will include seeding and a riprap apron underlain with geotextile filter fabric.

5.0 STORMWATER MANAGEMENT MEASURES

The stormwater management system will be designed to divert the stormwater runoff away from the cover area and the soil removal area. The stormwater runoff will be collected in grass-lined channels. The runoff exits the southern grass-lined channels into a riprap apron. The runoff from both the north channel and south channel will be diverted into a temporary sediment trap to the south of the project area. The slight increase in stormwater runoff is insignificant in comparison to the total watershed area.

The attached stormwater calculations are based on the Soil Conservation Service 24-hour design storm events. The channels are design for a 25-year, 24-hour design storm event.

Stormwater management measures will be located and installed as indicated on the attached drawings.

6.0 ATTACHMENTS

- C-CV-K-0006 – Site Grading Plan
- C-CV-K-0007 – Sections and Details
- C-CV-K-0008 – Erosion and Sediment Reduction Notes and Details
- C-CLC-K-00284 – K-Area Burning/Rubble Pit and Rubble Pile Stormwater Drainage

7.0 REFERENCES

- South Carolina Regulation 72-300 Standards for Stormwater Management and Sediment Reduction
- South Carolina NPDES General Permit for Stormwater Discharges Associated with Construction Activities – SCR 100000
- C-SPP-K-00014 – Procurement Specification
  - Section 02110 – Clearing and Grubbing
  - Section 02200 – Earthwork
  - Section 02270 – Erosion Control
  - Section 02930 – Seeding, Fertilizing, and Mulching

SECTION 02110

CLEARING AND GRUBBING

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Clearing and grubbing of the project site.

B. Disposal of waste materials.

1.2 RELATED SECTIONS

A. Section 01050 – Site Survey

B. Section 02200 – Earthwork

C. Section 02270 – Erosion Control

1.3 SPECIAL REQUIREMENTS

A. Coordinate work with the placement of erosion and sediment reduction measures as described on the Subcontract Drawings.

B. Implement erosion reduction measures as indicated in the SMSRP/PPP and on the Subcontract Drawings for the project site and borrow areas prior to initiation of any clearing and grubbing activities.

C. Comply with the WMP.

1.4 MAINTENANCE AND SERVICES

A. Perform dewatering activities as necessary to complete the clearing and grubbing work.

B. Ensure that areas are dewatered such that the sides and base of excavated slopes remain stable, and that the excavation bottom provides a satisfactory base for the intended use. Dispose of water as specified within the Subcontract Field Conditions.

C. Grade area slopes to provide positive drainage at all times.

1.5 PROTECTION

A. Locate, protect and support existing utilities which may be encountered during the course of the work and which are not designated for relocation or removal.

B. Protect monitoring wells, benchmarks, baseline monuments, and survey control points from disturbance or destruction.

C. Use qualified surveyors to immediately replace any such point disturbed or destroyed.

D. Accomplish work to avoid damage to the site and existing site appurtenances not designated for removal.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.1 EXAMINATION/PREPARATION

A. Visit the proposed construction site, prior to bid, to assess the amount and extent of trees, underbrush, etc. to be removed.

3.2 CLEARING

A. Soil Removal Area and Cover Area:
1. Cut up snags, brush, grass, floatable material, weeds, rubbish, and other objectionable vegetative growth.
2. Cut brush flush with the ground surface to facilitate grinding.
3. Dispose of vegetation per WMP.

B. Outside Soil Removal Area and Cover Area:
1. Cut up snags, brush, grass, floatable material, weeds, rubbish, and other objectionable vegetative growth.
2. Cut brush flush with the ground surface to facilitate grubbing.
3. Dispose of vegetation per Subcontract Field Conditions.

3.3 GRUBBING

A. Soil Removal Area and Cover Area:
1. Do not grub within the soil removal area and cover area.
2. Grind the stumps and vegetation root masses a minimum of 6 inches below the ground surface in the soil removal area.
3. Grind the stumps and vegetation root masses a minimum of 2 feet below the ground surface in the soil cover area.

B. Outside Soil Removal Area and Cover Area:
1. Grub to a minimum depth of 18 inches below rough grade or natural ground surface.

3.4 STOCKPILING

A. Stockpile material per the Subcontract Drawings.

B. Do not stockpile material from the borrow area.

3.5 DISPOSAL

A. Do not burn trees, timber, stumps, roots, brush, and other vegetation unless otherwise allowed within the Subcontract Field Conditions.

B. Dispose of spoil material as specified in the Subcontract Field Conditions.

END OF SECTION

00182

SECTION 02200

EARTHWORK

PART 1 – GENERAL

1.1 SECTION INCLUDES:

A. Rough grading, finish grading, and topsoil placement over the entire Project Site.

B. Excavation, stockpiling, loading, and hauling operations from the borrow site.

C. Topographic surveys of the Project Site.

1.2 RELATED SECTIONS

A. Section 01050 – Site Survey

B. Section 01090 – Reference Standards

C. Section 02110 – Clearing and Grubbing

D. Section 02270 – Erosion Control

E. Section 02930 – Seeding, Fertilizing, and Mulching

1.3 REFERENCES

A. ASTM D2487-98 Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)

1.4 DEFINITIONS

A. Common fill: Backfill material as specified in Part 2.

B. Spoil material: Undesirable material not approved for use in common or structural fill, which must be removed from areas receiving fill.

1.5 SUBMITTALS

A. Conform to the requirements of Section 01300.

B. Pre-Construction Topographic Survey per Paragraph 3.1.D.

C. As-Built Topographic Survey per Paragraph 3.13.A.

1.6 SPECIAL REQUIREMENTS

A. Comply with the WMP.

1.7 STOCKPILING

A. Stockpile material per the Subcontract Drawings.

B. Do not stockpile material from the borrow area.

PART 2 – PRODUCTS

2.1 COMMON BACKFILL

A. Common backfill shall consist of soils defined per ASTM D2487 as SW, SP, SM, or SC. The soil shall be free from organic material, loam, trash, snow, ice, frozen soil, rock greater than 2 inches in diameter, and other material not suitable for backfill material as determined by BSRI. The soil must be readily placed, spread, and compacted to the requirements specified in Part 3.

2.2 TOPSOIL

A. Friable soil capable of supporting vegetative growth that is free from trash, debris, stones larger than 1-1/2 inches, weeds, roots, sticks, brush, and other vegetation not suitable for subsequent seeding operations and maintenance.

2.3 MATERIAL SOURCE

A. All material except topsoil shall be obtained from onsite borrow areas identified in the Subcontract Field Conditions.

PART 3 – EXECUTION

3.1 EXAMINATION/ PREPARATION

A. Perform clearing and grubbing in accordance with Section 02110.

B. Coordinate work with the placement of erosion and sediment control measures. Provide berms and temporary swales as required to divert stormwater away from the soil removal areas and open trenches.

C. Implement erosion control measures as indicated in Section 02270, the SMSRP/PPP, and on the Subcontract Drawings for the project site and borrow areas.

A. Perform pre-construction topographic surveys of the project site conforming to the requirements of Section 01050. Submit:

1. Pre-construction topographic survey indicating contour elevations of the pre-construction grades of the project site using a 25-foot grid, including soil removal areas, soil cover area, drainage channels and structures, and access roads.

D. Locate, identify, and stake the location of known utilities, and protect existing utilities from damage. Protect benchmarks, survey control points, utilities, and existing structures from construction equipment and vehicular traffic.

3.2 DEWATERING DURING CONSTRUCTION

A. Ensure that excavated areas are dewatered such that the sides and base of excavated slopes remain stable and that the excavation bottom provides a satisfactory base for the intended use. Notify BSRI prior to commencement of any dewatering activities to assure that appropriate approvals are obtained, and to assure notification of the Environmental Coordinator.

B. Grade area to provide positive drainage at all times.

3.3 GENERAL EXCAVATION

A. Use excavation methods that do not adversely affect the surrounding areas.

B. Perform excavation in a manner to prevent damage due to soil migration, erosion, or slope failures. Provide slope support and shoring, as required.

3.4 GENERAL SITE GRADING, FILL AND BACKFILL

A. Prior to placing fill and backfill for the soil cover area, proof roll the existing soil using a minimum of five passes of a vibratory roller having a minimum dynamic force of 30,000 pounds per drum.

B. Place material in horizontal layers not to exceed the following lift thickness:
   1. Compaction by self-propelled or towed mechanical equipment: 12-inch uncompacted thickness
   2. Compaction by hand-operated mechanical equipment: 9- inch uncompacted thickness

C. Compact each lift of common fill placed as grading fill for the soil cover using a minimum of 5 passes of a vibratory roller having a dynamic force of 30,000 pounds per drum.

D. Do not place successive lifts of material until the compaction requirements of the previous lift have been verified.

E. Adjust the moisture content of loose material after placement by wetting or drying as may be required.

F. Excavate and replace material that is soft and yielding because of excess water content or scarify the material and allow it to dry before compacting to the project requirements. If over-excavation occurs, place and compact fill in accordance with this section.

G. Maintain positive drainage on the surface of unfinished fills/backfills. Blade the unfinished surfaces smooth to a crown at the conclusion of each day's work. Dispose of material that has become saturated or recondition the soil to conform to the project requirements.

H. Suspend material placement and compaction activities where moisture conditioning is required and the ambient temperature is 32 degrees F and falling. Do not leave a lift in an uncompacted state at the close of a day's operation when temperatures are expected to be below 32 degrees F. Do not place a layer of material on top of snow, ice, or soil that has been permitted to freeze prior to compaction. Removal of these unsatisfactory placements will be required.

I. Uniformly grade the areas within the scope of the project including excavated and filled locations. Provide a smooth and compacted finished surface that is free from irregular surface changes. Construct temporary ditches to permit drainage as required.

J. Perform final grading to lines and grades provided on Subcontract Drawings.

3.5 BORROW AREAS

A. Perform grubbing of the borrow areas as required and dispose of strippings and spoil material in accordance with the Subcontract Field Conditions.

B. Excavate and haul the borrow soil to the project site. Borrow soil may be stockpiled within the borrow area.

C. Excavate, remove, and properly dispose of spoil materials found within the borrow area. Dispose of spoil material in accordance with the Subcontract Field Conditions.

D. Remove borrow soil such that a uniform mixture of individual layers will result. Remove and dispose of distinctly different unusable soil as it is encountered within the borrow excavation.

E. Use excavation methods that do not adversely affect the surrounding areas.

F. Perform excavation in a manner to minimize ponding of water. Perform dewatering if required.

G. Perform excavation in a manner to prevent damage due to soil migration, erosion, or slope failures. Provide slope support and shoring, as required.

H. After borrow excavation operations are complete, the excavated area shall be neat in appearance, self-draining with stable side slopes, and shaped for easy cross-sectioning.

I. Construct temporary roads as approved by BSRI. At the project completion, remove the temporary roads and restore the land to its original condition.

3.6 TOPSOIL

A. Place a 3-inch thick lift of topsoil. Lightly compact the topsoil to ensure contact with the underlying soil. Avoid excessive compaction of the topsoil layer.

B. Provide topsoil over common fill in all disturbed areas.

C. Final grade of the topsoil layer shall conform to the grades indicated on the Subcontract Drawings.

D. Vegetate the topsoil area within 72 hours of placing the topsoil. Conform to the seeding requirements indicated in Section 02930.

3.7 COMPACTION METHODS

A. Compact each layer of backfill/fill to conform with the following minimum compaction requirements:

Area of Compaction	Percent Laboratory Maximum Dry Density
Common fill	Proof-rolled per Article 3.4, no testing required
Topsoil layer	Light compaction per Article 3.6

B. Use roller compaction equipment where possible.
   1. Make roller trips in parallel paths.
   2. Overlap the adjacent trip by not less than 2 feet.

C. Use power tampers or vibratory compactors where placement areas are not accessible to roller compaction equipment. Obtain BSRI review and acceptance where other means are used to obtain the required degree of compaction.

3.8 SWALES AND DITCHES

A. Cut accurately to the shape and grades indicated on the Subcontract Drawings (allow for topsoil layer thickness).

B. Acceptable excavated materials may be placed in fill areas or stockpiled. Dispose of spoil and excess excavated material in accordance with Subcontract Field Conditions.

C. Do not place excavated material closer than 3 feet from the edges of the ditches and provide positive drainage at all times.

D. Where over-excavation or erosion occurs during the construction of swales/channels, re-build to the design grade by placing common backfill material and compacting in accordance with Article 3.4.

E. Place a minimum 3 inch thick topsoil layer on all swales and channels. Provide erosion control matting on all swales and ditches, and vegetate in accordance with Section 02930.

3.9 SEEDING

A. Seed disturbed areas of both the project site and borrow areas upon completion of work in accordance with Section 02930.

3.10 REPAIRS

A. Repair damage by erosion or other causes that occurs during and after the completion of grading and seeding. These repairs include, but are not limited to, filling washes, smoothing irregularities, and repairing incidental damage.

3.11 TOLERANCES

A. Spot-check each loose lift of fill material placement every 500 square feet and not less than one for each lift for conformance with the maximum thickness requirements prior to compaction.

B. Place and compact material and provide site grading to the lines, grades, sections, and elevations indicated on the Subcontract Drawings, within a tolerance of plus or minus 0.15 feet. However, maintain a smooth grade and provide positive drainage at all times.

3.12 CLEANING

A. Provide dust control during construction activities.

B. Remove debris, spoil, and surplus materials after the completion of this construction activity.

C. Restore areas inadvertently disturbed to their original condition. Dispose of strippings and rejected materials in accordance with the Subcontract Field Conditions.

3.13 AS-BUILT TOPOGRAPHIC SURVEY

A. Perform post-construction topographic surveys of the project site conforming to the requirements of Section 01050. Submit:

1. As-built topographic survey indicating contour elevations of the final grades of the project site (disturbed area) using a 25-foot grid, including soil removal areas, soil cover area, drainage channels and structures, and access roads.

END OF SECTION

SECTION 02270

EROSION CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Technical requirements for procurement and installation of erosion control measures including riprap, silt fences, hay bales and geotextile filter material.

B. Stormwater and Sediment Control Inspection Form, Attachment A.

1.2 RELATED SECTIONS

A. Section 02110 – Clearing and Grubbing

B. Section 02200 – Earthwork

C. Section 02930 – Seeding, Fertilizing, and Mulching

1.3 REFERENCES

A.	ASTM C88-99	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
B.	ASTM C127-93	Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate AASHTO T85
C.	ASTM C535-96	Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
D.	ASTM D4632-96	Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
E.	ASTM D4751-99	Standard Test Method for Determining Apparent Opening Size of a Geotextile
F.	ASTM D4833-96	Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products

1.4 SUBMITTALS

A. Conform to the requirements of Section 01300.

B. CMTR for geotextile filter material per Article 2.1.

CMTR for riprap per Article 2.4.

1.5 INSPECTION/TESTING REQUIREMENTS

A. Implement erosion control measures as indicated in the SMSRP/PPP and the Subcontract Drawings for the project site and borrow areas.

B. Perform an inspection of erosion control measures once every 7 days and/or after each rainfall that exceeds 0.5 inches in a 24-hour period. Document these inspections on the Stormwater and Sediment Control Inspection Form (Attachment A). Maintain the completed inspection forms at the project site and make available to BSRI upon request.

C. BSRI will conduct periodic surveillance of erosion control activities. Provide access to Westinghouse Savannah River Company (WSRC) Environmental Protection Department (EPD) personnel and SCDHEC personnel for inspection of erosion control activities.

1.6 GENERAL REQUIREMENTS

A. Take measures necessary throughout the life of the Project to control erosion, and to eliminate silting of streams, and impoundments.

B. Install, maintain, and inspect erosion control measures (temporary and permanent) in accordance with requirements stated in this section.

C. The erosion and sediment control requirements specified in the Subcontract Documents are in accordance with South Carolina Regulation 72-300 and stormwater general permit SCR 100000.

1.7 PACKAGING, HANDLING, SHIPPING, AND STORAGE

A. Handle and store silt fence and geotextile filter fabric material in accordance with the manufacturer's recommendations. Label and/or tag each roll of filter fabric to provide product identification sufficient for field identification as well as inventory and quality control purposes.

1.8 MAINTENANCE AND SERVICES

A. Temporary erosion control measures shall remain in place and be maintained until long term vegetation is established.

PART 2 - PRODUCTS

2.1 GEOTEXTILE FILTER

A. Nonwoven, spun bonded 100 percent continuous filament polypropylene; minimum weight of 8 ounces per square yard.

B. Minimum Average Roll Value (MARV) for puncture resistance of 95 lbs. as determined by ASTM D4833.

C. Equivalent apparent opening size of 70 to 120 sieve as determined by ASTM D4751.

2.2 SILT FENCE

A. Woven polypropylene fabric with a finished edge at the top.

B. Maximum equivalent apparent opening size of 50 sieve. Attach to commercially available wooden fence posts.

C. Minimum Tensile Strength: Warp = 120 pounds, Fill = 100 pounds as determined by ASTM D4632.

2.3 HAY BALES

A. Locally available hay bales bound with baling twine.

B. Nominal dimensions of 3 feet long by 1.5 feet wide by 1.5 feet high.

C. Anchor with wood stake. Do not use rebar.

2.4 RIPRAP

A. Stone that is hard, dense, and durable, angular to subangular in shape with minimum specific gravity of 2.4 as determined by ASTM C127

B. Maximum loss of 55 percent due to abrasion when tested in accordance with ASTM C535, and a maximum loss of 15 percent when tested for soundness in accordance with ASTM C88.

C. Class "B" riprap, well graded from a minimum dimension of 8 inches to a maximum dimension of 16 inches, and no less than 50 percent of the stones with a least dimension of 12 inches. The least dimension shall not be less than one-third of the greatest dimension.

PART 3 - EXECUTION

3.1 EXAMINATION/PREPARATION

A. Clear areas designated for construction entrances and exits of obstruction, depressions, debris, and soft or low density pockets of soil.

3.2 GEOTEXTILE FILTER UNDER RIPRAP AND CONSTRUCTION ENTRANCE

A. Place in accordance with manufacturer's recommendations. Do not allow equipment on unprotected geotextile filter. Overlap the geotextile perpendicular to the direction of flow and such that the upstream piece laps on top of the downstream piece. Trench in the terminal ends and edges of the geotextile fabric at least 6 inches and anchor them to prevent runoff water from flowing under the edges of the fabric.

B. Reject geotextile during installation if it has defects, rips, holes, flaws, deterioration, or damage incurred during manufacture, transportation, storage, or installation.

C. Place the riprap with care to prevent puncture of geotextile filter. Cover the geotextile filter with riprap within 7 calendar days after installation.

D. Place the gravel layer with care to prevent puncture of geotextile filter. Cover the geotextile filter with gravel layer within 7 calendar days after installation.

3.3 SILT FENCE

A. Locate as indicated on the Subcontract Drawings. Install additional silt fence as field conditions warrant to prevent sediment migration.

3.4 HAY BALES

A. Place and install as indicated on the Subcontract Drawings and install additional hay bales as field conditions warrant to prevent sediment migration.

3.5 RIPRAP

A. Locate and place to conform to the lines and grades indicated on the Subcontract Drawings.

B. Place on the geotextile in such a manner so as to not damage the geotextile filter and such that adjacent stones are in close contact and, in general, have their greatest dimensions perpendicular to the slope.

C. Fill the spaces between the larger stones with spalls and smaller stones of the largest feasible size to form a compact mass. Do not place spalls and small stone in nests in lieu of using larger size stone.

D. Place riprap along the lower edge of an area using the largest stones set in a trench so as to form a toe. Do not use stone in the exposed face that extends less than one-half the thickness of the riprap except for spalls used to fill voids between larger stone.

E. The top elevation of riprap shall be flushed with the surrounding ground elevation.

3.6 TEMPORARY SWALES AND DIVERSIONS

A. Conform to the requirements of Section 02200 and the subcontract drawings.

3.7 CLEANING/ADJUSTING

A. Do not leave any debris, waste, or surplus materials after the completion of this construction activity. Restore areas inadvertently disturbed to their original condition.

3.8 REMOVAL OF TEMPORARY CONTROLS

A. Remove temporary erosion control devices upon acceptance of permanent vegetation by BSRI.

END OF SECTION

007989

Stormwater and Sediment Control Inspection Form

Unclassified ☐ Other ☐ Refer to 7Q, Security Manual

Outfall No.	Inspection Frequency:	☐ WEEKLY ☐ MONTHLY ☐ QUARTERLY
Construction Subcontract No.		☐ 0.5" Rain ☐ Other, Specify_____

INSPECTION ATTRIBUTES:	Accept	Reject	N/A
1. HOUSEKEEPING			
a) General area			
b) Material Storage Area			
2. VEGETATION AND SURFACE TREATMENT			
a) Installed per SMSRP/PPP			
b) Wash out of vegetative cover			
c) Vegetation established over 80% of coverage area within 20 days			
3. EROSION AND SEDIMENT CONTROL MEASURES			
a) General Area per SMSRP/PPP			
b) Sediment load no greater than 30% of barrier height			
c) Signs of sediment loading in receiving areas not listed in plan			
4. CHANNELS AND CULVERTS			
a) Installed per SMSRP/PPP			
b) Sediment load no greater than 20% of channel depth or culvert diameter			
c) Erosion (scour) in the area is minimal			
d) Other obstructions identified			
e) Signs of any significant spills in the area			
INLET AND OUTLET PROTECTION			
a) Installed per SMSRP/PPP			
b) Adequate protection			
c) Protective liner is acceptable			
6. SEDIMENT TRAPS AND BASINS			
a) Installed per SMSRP/PPP			
b) Remaining capacity of the basin in adequate			
7. PERIMETER PROTECTION			
a) Outside areas are not being impacted			
8. SPILLWAYS			
a) Installed per SMSRP/PPP			
b) Maintenance is adequate			
9. PPP CONFORMANCE			
a) Significant changes in activity or material stored in the area since the last Inspection			
b) Best Management Practices have been implemented			
c) Other items which could affect compliance with applicable permits/plans			

10. Note observations or resolutions of deficiencies below:

Inspector (Signature)	Job Title	Date

CERTIFICATION STATEMENT

I certify that I am familiar with the information contained in this inspection report and that to the best of my knowledge and belief, the information is true, complet accurate.

Delegated Authority (Signature) _____ Date_____

INSTRUCTIONS FOR STORMWATER AND SEDIMENT CONTROL INSPECTION FORM

Outfall No:	Enter the outfall number if applicable
Construction Project No:	Enter the SRS Project Number
Inspection Frequency:	Frequency should be performed per the requirements of this specification. Check the appropriate box for type of inspection.

Inspection Attributes: Check the appropriate box for the following questions:

1. HOUSEKEEPING
   - a) Is the housekeeping of the general area maintained in an orderly manner?
   - b) Is the housekeeping of the material storage area maintained in an orderly manner?

2. VEGETATION AND SURFACE TREATMENT
   - a) Are vegetation and surface treatments installed per the requirements of the SMSRP/PPP?
   - b) If there is evidence of washout of the vegetative cover, is it kept to a minimum?
   - c) Has the vegetation been established over 80% of the exposed area within a 20 day time period?

3. EROSION AND SEDIMENT CONTROL MEASURES
   - a) Are the erosion and sediment control measures of the general area installed per requirements of the SMSRP/PPP?
   - b) Are the sediment loads on the erosion and sediment control measures ≤ 30 % of the barrier height?
   - c) Are there signs of sediment loading in receiving areas not listed in the plan? Sediment loading in these areas is not acceptabl

4. CHANNELS AND CULVERTS
   - a) Are channels and culverts installed per the requirements of the SMSRP/PPP?
   - b) Are the sediment loads on the channels and culverts ≤ 20 % of channel depth or culvert diameter?
   - c) Is erosion (scour) in the area kept to a minimum?
   - d) Are there any other obstructions in the channels and culvert, which are affecting their serviceability?
   - e) Are there any signs of significant spills in the area? Spills are not acceptable and will require cleanup.

5. INLET AND OUTLET PROTECTION
   - a) Are inlet and outlet protection measures installed per the requirements of the SMSRP/PPP?
   - b) Are inlet and outlet protection measures providing adequate protection?
   - c) Is the protective liner acceptable and verified for proper installation?

6. SEDIMENT TRAPS AND BASINS
   - a) Are sediment traps and basins installed per the requirements of the SMSRP/PPP?
   - b) Is the remaining capacity of the sediment basin adequate?

7. PERIMETER PROTECTION
   - a) Are perimeter protection measures protecting the outside areas from being adversely impacted by the construction activities?

8. SPILLWAYS
   - a) Are spillways installed per the requirements of the SMSRP/PPP?
   - b) Are spillways adequately maintained?

9. PPP CONFORMANCE
   - a) Have there been significant changes in activity or materials stored in the area since the last inspection? If so, do these chan conform to the requirements of the PPP?
   - b) Are Best Management Practices being implemented and followed?
   - c) Are all other items/activities that could affect compliance with the applicable permits/plans being identified and implement to the requirements of the SMSRP/PPP and other applicable permits?

10. Indicate observations and/or resolutions for deficiencies from above.

Inspector: Signature of the Subcontract personnel performing the inspection

Delegated Authority: Signature of the Subcontractor's Representative.

SECTION 02930

SEEDING, FERTILIZING, AND MULCHING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Surface soil stabilization measures, including seeding, fertilizing and mulching.

1.2 RELATED SECTIONS

A. Section 01410 – Testing Laboratory Services

B. Section 02110 – Clearing and Grubbing

C. Section 02200 – Earthwork

C. Section 02270 – Erosion Control

1.3 REFERENCES

A. ASTM D4972-95 Rev.A Standard Test Method for pH of Soils

1.4 SUBMITTALS

A. Conform to the requirements of Section 01300.

B. CMTR for erosion control matting per Article 2.5.

1.5 ACCEPTANCE OF PERMANENT CONTROLS

A. Establishment of a satisfactory stand of perennial grass whose root system has developed sufficiently to survive dry periods, winter weather conditions, and be capable of reestablishment in the spring. Acceptance is based on EPD/SCDHEC and Natural Resources Conservation Service (NRCS) standards and field walkdowns.

1.6 PACKAGING, HANDLING, SHIPPING, AND STORAGE

A. Tag bags containing seeds to show weight, seed analysis, percent germination, and vendor name.

B. Handle and store products in accordance with the manufacturer's recommendations.

1.7 MAINTENANCE AND SERVICES

A. Maintain the seeded area until final acceptance of permanent controls. Perform reseeding of areas where required during the maintenance period.

PART 2 - PRODUCTS

2.1 SOIL PREPARATION MATERIALS

A. Topsoil: Provide in accordance with Part 2 of Section 02200.

B. Lime: Fine Dolomitic Limestone; 90 percent passing Number 10 sieve, 50 percent passing Number 50 sieve, and 35 percent passing Number 100 sieve; total calcium and magnesium carbonate content greater than or equal to 50 percent.

C. Fertilizer: Commercial 10-10-10, uniform in composition, dry, and free flowing.

D. Binder: Organic glue type tackifier or chemical mulch binder as approved by BSRI.

2.2 TEMPORARY SEEDING

A. Fall and Winter Planting: Use Rye at rate of 56 pounds per acre.

B. Spring and Summer Planting: Use Browntop Millet at a rate of 40 pounds per acre.

2.3 PERMANENT SEEDING

A. September – February:

Seed	Rate (Pounds per Acre)
Rye	10
Common Bermuda (unhulled)	130

Follow with over seeding area in March:

Seed	Rate (Pounds per Acre)
Browntop Millet	10
Common Bermuda (hulled)	86

B. March:

Seed	Rate (Pounds per Acre)
Rye	10
Common Bermuda (hulled)	90

C. April – June:

Seed	Rate (Pounds per Acre)
Browntop Millet	10
Common Bermuda (hulled)	40
Centipede	5

Note: Carpetgrass at a rate of 40 pounds per acre may be used in lieu of centipede.

D. July – August:

1. These months are marginal for planting and establishing permanent vegetation. Seeding shall be as recommended by the NRCS. The Subcontractor may plant temporary vegetation during this time frame and wait to plant permanent vegetation during a more optimal planting season.

2.4 MULCH

A. Straw: Long stem rye, wheat, oats, or barley that is not rotten or brittle.

B. Hydromulch: Natural wood cellulose with no bark; may contain 100 percent recycled material.

2.5 EROSION CONTROL MATTING

A. Side Slopes: Straw and coconut fiber matrix (at least 30 percent coconut fibers) sewn between two nets with a weight of at least 0.5-lbs/sq. yd. or equivalent.

B. Channels/swales: 100 percent coconut fiber, recycled nylon fiber, or a coconut/nylon composite matrix sewn between two nets with a weight of at least 0.5-lbs/sq. yd. or equivalent; Must withstand velocities up to 7 ft/sec.

C. Subcontractor may install centipede sod on the side slopes and channels/swales in lieu of erosion control matting at his option. Water the sod on a daily basis until permanent roots are established.

PART 3 - EXECUTION

3.1 PREPARATION

A. Place topsoil in accordance with Section 02200 prior to seeding. Grade the topsoil layer to conform to the Subcontract Drawings. No compaction testing is required for this layer.

B. Scarify the topsoil to a depth of 1-1/2 inches and water with a fine spray.

C. Place lime, fertilizer, seed, and mulch within 72 hours of topsoil placement.

3.2 FERTILIZER AND LIME

A. Determine pH of soils in accordance with ASTM D 4972, Method B. Apply fertilizer and lime at planting in accordance with the soil analysis recommendations.

B. Apply fertilizer and lime at the following rates at time of planting when soil analysis recommendations are not available:

1. 10-10-10 fertilizer or equal at a maximum rate of 1000 pounds per acre when the fertilizer is worked into the soil and lime at 1.5 tons per acre.
2. 10-10-10 fertilizer or equal at a maximum rate of 500 pounds per acre at time of seeding and 500 pounds per acres after the seed has germinated when the fertilizer is not worked into the soil and lime at 1-5 tons per acre.

D. Place soil nutrients in direct contact with the soil. Calibrate the soil nutrient equipment to ensure the applications are within 10 percent of the specified rates. Do not clean soil nutrient equipment within an environmentally sensitive area.

3.3 MECHANICAL SEEDING.

A. Apply seed at the rates per Article 2.3 using a mechanical spreader.

B. Place straw mulch at a rate of 4000 pounds per acre within 24 hours after seed placement.

C. Wet thoroughly

D. Maintain the area in a moist condition after seeding is complete until final acceptance of permanent controls. Use fine spray techniques for watering to avoid soil erosion.

3.4 HYDROSEEDING

A. Use a slurry application rate of 2500 gal/acre.

B. Slurry Mix
1. 1200 pounds per acre hydromulch.
2. Organic tackifier or chemical mulch binder (rate per manufacturer's recommendations).
3. 500 pounds per acre fertilizer.
4. Seed mix as specified above.

C. Use a follow-up application of fertilizer at a rate of 500 pounds per acre of fertilizer after germination of the seedlings.

D. Maintain the area in a moist condition after seeding is complete until final acceptance of permanent controls. Use fine spray techniques for watering to avoid soil erosion.

3.5 INSTALLATION OF EROSION CONTROL MATTING

A. Place erosion control matting on all side slopes, in all channels, and at locations indicated on the Subcontract Drawings.

B. Install erosion control matting immediately after seeding and in accordance with the guidelines indicated below. Use the manufacturer's recommendations when they exceed the guidelines indicated below.

C. Installation On Slopes
1. Prepare soil before installing matting, including application of lime, fertilizer and seed.
2. Begin at the top of the slope. Extend matting a minimum of 2 feet beyond the top of the slope
1. Anchor top of matting in a 6 inch deep by 6-inch wide trench. Staple matting in the trench on a 6-inch spacing. Backfill and compact trench.
2. Roll matting over the compacted trench and down the slope.
3. Overlap the edges 4 inches to 6 inches and staple on 24-inch centers (maximum). Overlap the ends "shingle style" 6 inches to 12 inches and staple on 12-inch centers.
4. On slopes 4 to 1 or steeper, install a staple check slot (line) at 30 feet to 40 feet intervals across the entire slope. Staple check slots are installed by placing a row of staples 4 inches apart across the slope, then placing a second row 4 inches down slope of the first row in a staggered pattern.

5. Staple bottom end on a 4-inch spacing. Staple matting between edges and check slots on a 2-foot by 2-foot pattern. Maintain matting to soil contact over entire area.

D. Installation In Channels/Swales

1. Prepare soil before installing matting, including application of lime, fertilizer and seed.
2. Begin at top of channel (direction of flow). Anchor matting in a 6-inch deep by 6-inch wide trench. Install staples on a 4-inch spacing in trench. Backfill and compact trench.
3. Roll matting over the compacted trench in direction of water flow in channel.
4. Overlap ends "shingle style" 6 inch to 12 inch and use a double row of staples 4 inches apart in a staggered pattern. Overlap side edges 4 inches to 6 inches and staple on 12 inch centers maximum.
5. At all points where concentrated flow enters the channel from the side, anchor the top edges of matting in a 6-inch deep by 6-inch wide trench. Staple the matting in the trench on 12 inch centers. Backfill and compact the trench. If no concentrated flow enters the channel from the side, staple the edges on 12-inch centers.
6. Install a staple check slot (line) at intervals of 30 feet to 40 feet. The staple check slot shall extend the entire width of the channel. Staple check slots are installed by placing a row of staples 4 inches apart across the entire channel and then placing a second row 4 inches down stream of the first row in a staggered pattern.
7. Anchor terminal end of matting in a 6-inch deep by 6-inch wide trench. Staple matting on 4 inch spacing in the trench. Backfill and compact the trench with matting over the compacted trench.
8. Staple matting between edges and check slots on a 2-foot by 1.5-foot pattern. Maintain matting to soil contact over entire area.

E. Cleaning

1. Do not leave any waste, debris, or other surplus material upon completion of this construction activity. Restore any areas inadvertently disturbed to their original condition.

END OF SECTION

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SOUTH CAROLINA REGISTERED PROFFESSIONAL ENGINEER NO.13683 MAHESH KUMAR PATEL
[signature] 12/19/00

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UNITED STATES DEPARTMENT OF ENERGY

SAVANNAH RIVER SITE

BLDG. NO.	SITE CLEARANCE NO.	DESIGN AREA NO.	DESIGN GROUP
131-K & 631-20G			PE&CD/ER

TITLE

K-AREA BURNING RUBBLE PIT (131-K) / RUBBLE PILES (631-20G)

SITE GRADING PLAN (U)

SCALE | SRP DRAWING NO. | SHEET NO. | LATEST REVISION

Site Grading Plan (U)
C-CV-K-0006

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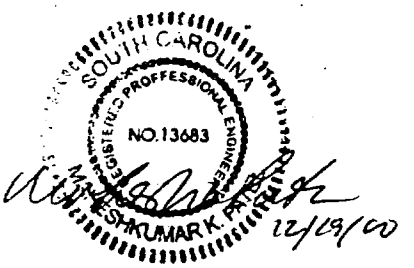

Westinghouse Savannah River Company
Environmental Protection Department

File= 01-01-K-25
Date Issued 1/3/01
By:

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UNITED STATES DEPARTMENT OF ENERGY

SAVANNAH RIVER SITE

BLDG. NO.	SITE CLEARANCE NO.	DESIGN AREA NO.	DESIGN GROUP
131-K & 631-20G			PE&CD/ER

TITLE

K-AREA BURNING RUBBLE PIT (131-K) / RUBBLE PILES (631-20G)

SECTIONS AND DETAILS (U)

SCALE	SRP DRAWING NO.	SHEET NO.	LATEST REVISION
AS NOTED	N/A		

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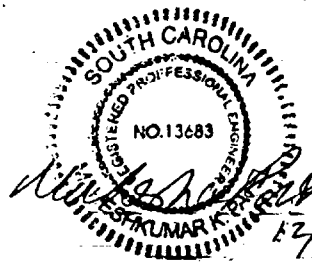
C-CV-K-0007



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UNITED STATES DEPARTMENT OF ENERGY

SAVANNAH RIVER SITE

BLDG. NO.	SITE CLEARANCE NO.	DESIGN AREA NO.	DESIGN GROUP
131-K & 631-20G		N/A	PE&CD/ER

TITLE

K-AREA BURNING RUBBLE PIT (131-K) / RUBBLE PILES (631-20G)

EROSION AND SEDIMENT REDUCTION NOTES AND DETAILS (U)

SCALE	SRS DRAWING NO.	SHEET NO.	LATEST REVISION
NONE	N/A	1 OF 1	0

W.R. BROWN LAST CADD REV. BY:
DATE:

Erosion and Sediment Reduction
Notes and Details (U)
C-CV-K-0008

Commercial Calculation Cover Sheet

007820

Project	Calculation Number	Project Number
K-Area Burning/Rubble Pit and Rubble Pile	C-CLC-K-00284	CA1219
Title K-Area Burning/Rubble Pit and Rubble Pile Stormwater Drainage (U)	**Functional Classification** GS	Page 1 of 56
	Discipline C/S/A	

☐ Preliminary ☒ Confirmed

Computer Program No.	Version/Release No.
EA1C-C-207V-002 ☐ N/A	HydroCad Version 5.11

Purpose and Objective

To calculate the pre-development and post development stormwater runoff from the K-Area Burning/Rubble Pit and Rubble Pile (KBRP/RP) and to determine the appropriate stormwater management measures.

Westinghouse Savannah River Company
Environmental Protection Department

File# 01-01-k-2.5
Date Issued 1/3/01
By: D.2 C

Summary of Conclusion

There is approximately a 2.1 cfs increase in runoff in a 10-year, 24-hour storm event from the pre-development conditions to the post-development runoff. Based on engineering judgement, there is a negligible increase when this small increase is included in the entire watershed.

The channels will not overflow and are designed to a 25-year, 24-hour storm event. The channel velocities are non-erosive for the proposed liner materials. The riprap dissipates energy and slows down the flow in the south channel so that the flow is non-erosive.

The runoff will be discharged to the surrounded wooded area and will have minimal impact to surrounding areas. During construction, the runoff will be diverted to a temporary sediment trap. The sediment trap will capture sediments from the concentrated flow of the disturbed area. The sediment trap will be regraded upon establishment of permanent vegetation.

Revisions

Rev No.	Revision Description
0	Issue for Construction.

Sign Off

Rev No.	Originator (Print) Sign/Date	Verifier/Checker (Print) Sign/Date	Manager (Print) Sign/Date
0	J. L. Statton Jennifer L. Statton 11-27-2000	S. M. Mead Stephen M. Mead 12-1-2000	MAHESH K. PATEL Mahesh K. Patel 12/13/00

Classification
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SOUTH CAROLINA REGISTERED PROFFESSIONAL ENGINEER NO.13683 MAHESH KUMAR K. PATEL
12/19/00

Calculation Sheet

	Project	Calculation No.
SRS	K-Area Burning/Rubble Pit and Rubble Pile	C-CLC-K-00284
	Subject	Sheet No
	K-Area Burning/Rubble Pit and Rubble Pile Stormwater Drainage (U)	Page 2 of

Rev	Originator	Date	Checker	Date	Rev	Originator	Date	Checker	Date
0	JJA	11-27-2000	SMM	12-1-2000					

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Calculation Sheet

	Project	Calculation No.
SRS	K-Area Burning/Rubble Pit and Rubble Pile	C-CLC-K-00284
	Subject	Sheet No.
	K-Area Burning/Rubble Pit and Rubble Pile Stormwater Drainage (U)	Page 3 of 56

Rev	Originator	Date	Checker	Date	Rev	Originator	Date	Checker	Date
0	GJA	11-27-2000	SMM	12-1-2000					

1.0 INTRODUCTION

1.1 Purpose

To calculate the pre-development and post development stormwater runoff from K-Area Burning/Rubble Pit and Rubble Pile (KBRP/RP) and to determine the appropriate stormwater management measures.

2.0 REFERENCES

2.1 South Carolina Stormwater Management and Sediment Control Handbook for Land Disturbance Activities, August 1998

2.2 Hydrocad Stormwater Modeling System Owners Manual, Version 5.11, 1998

2.3 Soil Survey of the Savannah River Site

2.4 SRS Drawings C-CV-K-0006, C-CV-K-0007, C-CV-K-0008

2.5 North Carolina Erosion and Sediment Control Planning and Design Manual, December 1993

3.0 INPUT DATA / ASSUMPTIONS

3.1 Use predevelopment condition that consists of lightly wooded areas, good pasture, and dirt roads.

3.2 Runoff curve numbers (Reference 2.2):

Woods	Fair, Soil Type B	60
Meadow	Mowed, Soil Type B	58
Bare Soil	Soil Type B	86

3.3 Rainfall, P (Reference 2.1):

2 yr. – 24 hr. storm	Barnwell County	3.9"
10 yr. – 24 hr. storm	Barnwell County	5.9"
25 yr. – 24 hr. storm	Barnwell County	6.9"

3.4 Existing Soil Type (Reference 2.3):

DoB	Dothan	Soil Type B
Uo	Udorthents	Soil Type B

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Calculation Sheet

SRS	Project K-Area Burning/Rubble Pit and Rubble Pile	Calculation No. C-CLC-K-00284
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0	JTA	11-27-2000	SMM	12-1-2000					

4.0 CALCULATION

The existing drainage sheet flows to the east and southeast areas of the project site. The main flow paths will discharge to the south and southeast. Channels will be installed to improve drainage.

A two foot soil cover will be installed over the KBRP/RP area and vegetated.

Hydrocad uses TR-55 to determine time of concentration and SCS TR-20 to determine runoff.

4.1 Input for Hydrocad

4.1.1 Pre Development (Reference 2.2):

(Drainage areas, channels, and flow paths – Page 13, Figure 1)

	CN	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6
Fair Woods (ac)	60	1.50	N/A	N/A	N/A	N/A	N/A
Meadow-mowed (ac)	58	2.71					
Bare Soil (ac)	86	-					
Total (ac)	-	4.21					-

	Area 1	Area 2	Area 3	Area 4	Area 5	A
TR-55 Sheet Flow	X	N/A	N/A	N/A	N/A	N/A
Shallow Concentrated/ Upland Flow						
Flow Description	Grass: dense					
Flow Path Length (ft)	300					
Change in Elevation (ft)	3					
Slope (ft/ft)	0.010					
TR-55 Sheet Flow						
Shallow Concentrated/ Upland Flow	X					
Flow Description	Wood-land					
Flow Path Length (ft)	297					
Change in Elevation (ft)	20					
Slope (ft/ft)	0.070					

4.1.2 Post Development (Reference 2.4):

(Drainage areas, channels, and flow paths – Page 14, Figure 2; Page 15, Figure 3)

	CN	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6
Fair Woods (ac)	60	-	-	-	-	-	-
Meadow-mowed (ac)	58	0.85	0.66	1.06	0.	0.22	47
Bare Soil (ac)	86	-	-	-	-	-	
Total (ac)	-	0.85	0.66	1.06	0.95	0.22	

Calculation Sheet

SRS	Project K-Area Burning/Rubble Pit and Rubble Pile	Calculation No. C-CLC-K-00284
	Subject K-Area Burning/Rubble Pit and Rubble Pile Stormwater Drainage (U)	Sheet No. Page 5 of 56

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0	QZ	11-23-2000	SMM	12-1-2000					

	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6
TR-55 Sheet Flow	X	X	X	X	X	X
Shallow Concentrated/ Upland Flow						
Flow Description	Grass: dense	Grass: dense	Grass: dense	Grass: dense	Grass: dense	Grass: dense
Flow Path Length (ft)	300	300	196	282	144	262
Change in Elevation (ft)	8	6	8	6	12	12
Slope (ft/ft)	0.027	0.020	0.040	0.021	0.083	0.046
TR-55 Sheet Flow			N/A	N/A	N/A	N/A
Shallow Concentrated/ Upland Flow	X	X				
Flow Description	Short grass pasture	Short grass pasture				
Flow Path Length (ft)	234	31				
Change in Elevation (ft)	6	1				
Slope (ft/ft)	0.026	0.033				

Area 2							
	Type	Length (ft)	Slope (ft/ft)	Width (ft)	Depth (ft)	Slope (sides)	n
Reach 1	Grass Channel	67	0.033	4	1	0.25	0.027
Reach 2	Grass Channel	120.4	0.05	4	1	0.25	0.027
Reach 3	Grass Channel	283.5	0.013	4	1	0.25	0.027

Area 3							
	Type	Length (ft)	Slope (ft/ft)	Width (ft)	Depth (ft)	Slope (sides)	n
Reach 2	Grass Channel	120.4	0.05	4	1	0.25	0.027
Reach 3	Grass Channel	283.5	0.013	4	1	0.25	0.027

Area 4							
	Type	Length (ft)	Slope (ft/ft)	Width (ft)	Depth (ft)	Slope (sides)	n
Reach 4	Grass Channel	172.1	0.03	4	1	0.25	0.027
Reach 5	Grass Channel	115.6	0.05	4	1	0.25	0.027
Reach 6	Riprap Apron	25	0.0001	4	1	0.25	0.033

Calculation Sheet

SRS	Project K-Area Burning/Rubble Pit and Rubble Pile	Calculation No. C-CLC-K-00284
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Rev	Originator	Date	Checker	Date	Rev	Originator	Date	Checker	Dat
0	JLA	11-27-2002	SMM	12-1-2002					

Area 5							
	Type	Length (ft)	Slope (ft/ft)	Width (ft)	Depth (ft)	Slope (sides)	n
Reach 5	Grass Channel	115.6	0.05	4	1	0.25	0.027
Reach 6	Riprap Apron	20	0.0001	4	1	0.25	0.033

4.1.3 Pre Vegetation

	CN	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6
Fair Woods (ac)	60	-	-	-	-	-	-
Meadow-mowed (ac)	58	0.49	0.45	-	0.74	0.02	-
Bare Soil (ac)	86	0.36	0.21	1.06	0.21	0.20	0.47
Total (ac)	-	0.85	0.66	1.06	0.95	0.22	0.47

	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6
TR-55 Sheet Flow	X	X	X	X	X	X
Shallow Concentrated/ Upland Flow						
Flow Description	Grass: dense	Grass: dense	Cultivated Residue >20%	Grass: dense	Grass: dense	Cultivated Residue >20%
Flow Path Length (ft)	300	300	196	272	30	262
Change in Elevation (ft)	8	6	8	5	1	12
Slope (ft/ft)	0.027	0.020	0.040	0.018	0.033	0.046
TR-55 Sheet Flow				X	X	
Shallow Concentrated/ Upland Flow	X	X				
Flow Description	Short grass pasture	Short grass pasture		Cultivated Residue >20%	Bare soil	
Flow Path Length (ft)	194	31		10	114	
Change in Elevation (ft)	6	1		1	11	
Slope (ft/ft)	0.011	0.033	N/A	0.100	0.096	N/A
TR-55 Sheet Flow						
Shallow Concentrated/ Upland Flow	X					
Flow Description		N/A		N/A	N/A	
Flow Path Length (ft)	140					
Change in Elevation (ft)	5					
Slope (ft/ft)	0.036					

Calculation Sheet

	Project	Calculation No.
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0	JZA	11-22-2000	SMM	12-1-2000					

4.2 Hydrocad Output

4.2.1 Pre Development

Conservatively assume that all peak flows occur at the same time for the total peak runoff.

(Hydrocad summaries and hydrographs – Pages 17-19)

		Area 1	Area 2	Area 3	Area 4	Area 5	Area 6	Total
Tc (min)	2&10 yr.	44.6	N/A	N/A	N/A	N/A	N/A	-
Peak Runoff (cfs)	2 yr.	1.31						1.31
	10 yr.	4.43						4.43

4.2.2 Post Development

Conservatively assume that all peak flows occur at the same time for the total peak runoff.

(Hydrocad summaries and hydrographs – Pages 20-50)

		Area 1	Area 2	Area 3	Area 4	Area 5	Area 6	Total
Tc (min)	2&10 yr.	31.1	31.5	16.8	29.1	9.8	20.0	-
Peak Runoff (cfs)	2 yr.	0.31	0.24	0.59	0.36	0.16	0.23	1.88
	10 yr.	1.09	0.84	2.01	1.28	0.53	0.81	6.56

Area	Reach	Description (Depth)	Peak Depth (ft)			Peak Velocity (ft/s)		
			2 yr.	10 yr.	25 yr.	2 yr.	10 yr.	25 yr.
2	1	New Grass Channel (1 ft)	0.03	0.09	0.12	2.0	2.0	2.3
	2	New Grass Channel (1 ft)	0.02	0.08	0.10	2.5	2.5	2.5
1,2, & 3	3	New Grass Channel (1 ft)	0.13	0.27	0.34	1.6	2.3	2.6
4	4	New Grass Channel (1 ft)	0.04	0.12	0.15	1.9	2.3	2.6
4&5	5	New Grass Channel (1 ft)	0.04	0.11	0.13	2.5	2.8	3.1
4&5	6	Riprap Apron (1 ft)	0.20	0.42	0.52	0.10	0.20	0.3(

The channel flows are non-erosive. The peak depth of each channel does not exceed the depth of the channel and overflow.

4.2.3 Pre Vegetation

The total runoff will leave the site through Reach 3, Reach 6, or Area 6.

(Hydrocad summaries and hydrographs – Pages 51-56)

		Reach 3	Reach 6	Area 6	Total
Peak Runoff (cfs)	10 yr.	7.21	1.86	2.47	11.54
	25 yr.	9.01	2.51	2.99	14.51

4.3 Riprap

4.3.1 Post Development

The riprap apron is the outlet for the runoff from Areas 4 and 5 runoff. The actual design parameters specified exceed the theoretical parameters (Page 16; Reference 2.5, Figure 8.06.a). Class B riprap (1.0 ft diameter) sufficiently meets and exceeds the criteria determined from minimum theoretical parameters.

Hydrocad ouput reflects that the riprap apron (Reach 6), at an average width of 12 ft (4-20 ft) and a length of 20 ft, will result in a non-erosive flow outlet from the grass channel (Reach 5).

5.0 SEDIMENTATION CONTROLS

The largest disturbed area for this project will occur where the new soil cover is being constructed. This area of disturbance is approximately 2.51 acres. The stormwater for the entire area is over 4.21 acres.

To minimize the transport of sediment from the disturbed area, the following note will be placed on the grading plan:

To minimize offsite sediment transport from cover soils during installation, installation shall be completed in a timely manner without major construction delays. Stage construction of soil cover to minimize the size of exposed areas and the length of time the areas are exposed. Topsoil shall be placed immediatel after final subgrades are established and stabilized with vegetation as specified in the SMSRP/PPP C-ERP-K-00002.

Estimated construction time for the cover installation is 2 months; therefore, the cover soils will be exposed during that time until the seeding and mulching of the cover soils. Once the cover vegetation is established, (approximately 4 weeks) the transport of sediment should be reduced substantially.

Temporary sedimentation controls, such as silt fence and hay bales, will aid to control the sediment from leaving the site. Hay bale and silt fence barriers will be utilized within channels with concentrated flow t function as sediment traps. These traps will be utilized primarily in reaches.

Disturbed area draining to Reaches:

To north channel	1.63 acres
To south channel	0.41 acres
Total channels:	**2.04 acres**

Total Drainage = 4.21 Acres
Undisturbed Area = (4.21 – 2.51) = 1.70 acres

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0	[illegible]	11-27-2001	[illegible]	12-4-2002					

Disturbance of the area is small and short-term, therefore a temporary sediment trap can be utilized to capture sediment until permanent vegetation is established.

Predominant Soil Type: Uo (Reference 2.3)

Average soil type based on data from Central Shops Borrow Pit:
Soil Type Ailey HGS (B) Depth 0-24 inches K = 0.15 and D_{15} = 0.0462 mm (Ref. 2.1, Pg 102, Erosion Related Information for SC Soils)

Utilize Universal Soil Loss Equation to determine amount of expected sediment:

A= RKLSCP
A = Soil Loss (Tons/Acre/Year)
R = Rainfall Factor
K = Soil Erodibility Factor
LS = Slope Length Factor
C = Cover and Management Factor
P = Conservation Practice Factor

Sediment Contribution From the Disturbed Area:

R = 275 (Ref. 2.1, Page 126)
K = 0.15
LS = 0.53 (Slope length = 196 feet @ 4 percent)
C= 1.0 (Bare ground with no cover)
P = 1.3

Disturbed Area Soil Loss = (275)(0.15)(0.53)(1.0)(1.3)
= 28.42 tons/acre/yr

Note: Since the trap also includes drainage water from the undisturbed area, this water will also contribute sediment to the drainage basin.

Sediment Contribution From the Undisturbed Area:

R = 275 (Ref. 2.1, Page 126)
K = 0.15
LS = 0.40 (Slope lengths average 307 feet @ 3.0 percent):
C = 0.01 (Native Vegetation- undisturbed)
P = 1.0

Undisturbed Area Soil Loss = (275)(0.15)(0.40)(0.01)(1.0)
= 0.17 tons/acre/yr

Sediment Contribution From the Total Area:

Total Sediment to Sediment Trap: = (28.42 tons/acre/yr)(2.51 Acres)
= 71.62 tons/yr

Assume the sediment density @ 75 lbs/ ft^3

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0	[signature]	11-17-2000	[signature]	12-1-2000					

Total Volume of Sediment per year: = (71.62 tons/yr)(2,000 lbs/ton) / (75 lbs/ft^3)
= 1910 ft^3/yr

Determine Amount of Surface Area Required for Sediment Trap:

Reference 2.1: Soil Type Ailey HGS (B) 0-24 inches D_{15} = 0.0462

The diameter corresponds to a point on the eroded particle size distribution curve such that 15 % of the particles (by weight) are equal to or smaller than this size. If trap collects all particles above this size, trap efficiency is 1 – 0.15 = 0.85 or 85 percent.

Determine Amount of Surface Area Required for Sediment Trap (Continued):

The sediment trap will be designed for input from both ends of the trap. The maximum flow for one side of the trap is from Reach 3 in addition to the sheet flow from Area 6. The 10-year 24-Hour Design Storm flow is 9.68 ft^3/s. Each side of the trap will be designed to this maximum flow.

The settling velocity for a 0.0462 mm soil particle is 0.0062 feet per second.

As = 1.2 Q / Vs
As = (1.2) (9.68 ft^3/s) / (0.0062 ft/s)
As = 1874 ft^2 of water surface area

The minimum surface area for each trap is 1874 ft^2.

Use a L:W ratio of 2:1
$2W^2 = 1874$
W = 31 ft
L = 2W
L = 2(31)
L = 62 ft

Each side of the trap will have an approximate minimum flow length of 62 ft and an approximate minimu width of 31 ft. The entire trap will have a minimum flow length of 124 ft (two 62 ft flow lengths end to en and a minimum width of 31 ft.

Use a minimum depth of 2 feet: Use a 2:1 side slope

Volume of Sediment Trap: $V = H L W - S H^2 L - S H^2 W + 2 S^2 H^3$

For 1 Foot of Sediment:
$V = (1 ft)(62 ft)(31 ft) - (2 ft)(1 ft)^2(62ft) - (2)(1 ft)^2(31 ft) + (2)(2)^2(1 ft)^3$
V = 1744 ft^3

Fequency of Sediment Trap Cleanout:

Udorthent Soils: 1744 ft^3 / (1910 ft^3/yr)
0.91 yr Assume once a year

Note: It is expected that the soil cover will be constructed and stabilized within 6 months.

Calculation Sheet

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0	[signature]	11-27-2002	[signature]	12/-2002					

Design of Outlet for the sediment trap will be a stone weir:

Weir Length: (2.5)(4.21 acres) = 10.53 ft **Use a Weir Length of 11 ft**

One weir will serve the two abutting sediment traps. This weir will be designed for twice the maximum flow from Reach 3 and Area 6. This will ensure that the trap is sufficient to accommodate the flow from Reach 3, Reach 6, and Area 6.

The sediment trap outlet using a stone section will be located at the low point in the basin. The top section will serve as a nonerosive spillway outlet for flood flows, and the bottom section will provide a means of dewatering the basin between runoff events.

Stone Size for Weir:

The outlet will be constructed using well-graded stones per ASTM C33, size 1 (1½ – 3 ½ inches in diameter).

Side slopes of the spillway section shall be 1.5:1 or flatter. To protect the embankment, the sides of the spillway shall be at least 21 inches thick. To prevent piping, a geosynthetic filter fabric will be placed on the foundation below the riprap.

Flow Capacity of the Weir:

Weir width will equal 3 feet.

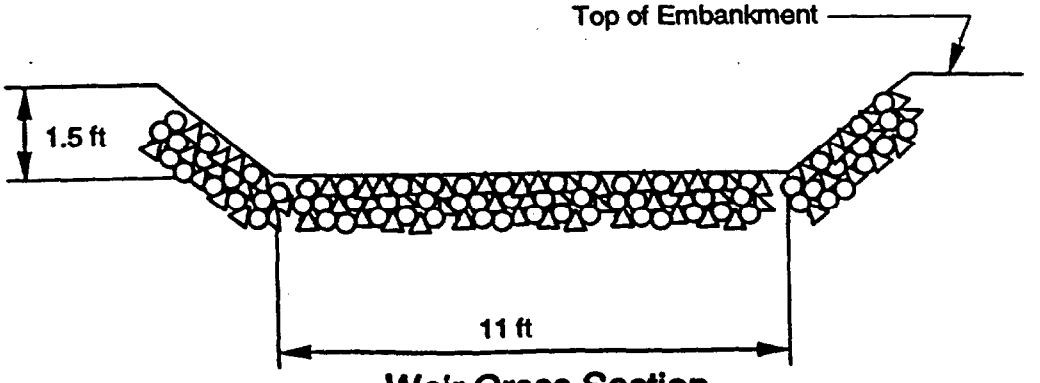
Broad-Crested Weir: For a head of 1 foot and width = 3 feet, c = 2.65

$Q = cLH^{3/2}$

$Q = (2.65)(11\ ft.)(1.0\ ft)^{1.5}$
$Q = 29.2\ ft^3/s$

10 year 24 hour design storm $Q = 2(3.86)\ ft^3/s = 9.86\ ft^3/s$
25 year 24 hour design storm $Q = 2(5.62)\ ft^3/s = 12.0\ ft^3/s$

$29.2\ ft^3/s > 9.862\ ft^3/s$ and $12.0\ ft^3/s$; therefore, outlet weir is adequate.



Weir Cross Section

Since the weir will be placed in the center of the entire minimum 124 ft length of the sediment trap, the length of the weir will be added to the minimum length of the sediment trap.

The minimum dimensions of the sediment trap to accommodate the weir will be an approximate 135 ft length, 31 ft width, and 2 ft depth.

6.0 CONCLUSION

There is approximately a 2.1 cfs increase in runoff in a 10-year, 24-hour storm event from the pre-development conditions to the post-development runoff. Based on engineering judgement, there is a negligible increase when this small increase is included in the entire watershed.

The channels will not overflow and are designed to a 25-year, 24-hour storm event. The channel velocities are non-erosive for the proposed liner materials. The riprap dissipates energy and slows down the flow in the south channel so that the flow is non-erosive.

The runoff will be discharged to the surrounded wooded area and will have minimal impact to surrounding areas. During construction, the runoff will be diverted to a temporary sediment trap. The sediment trap will capture sediments from the concentrated flow of the disturbed area. The sediment trap will be regraded upon establishment of permanent vegetation.

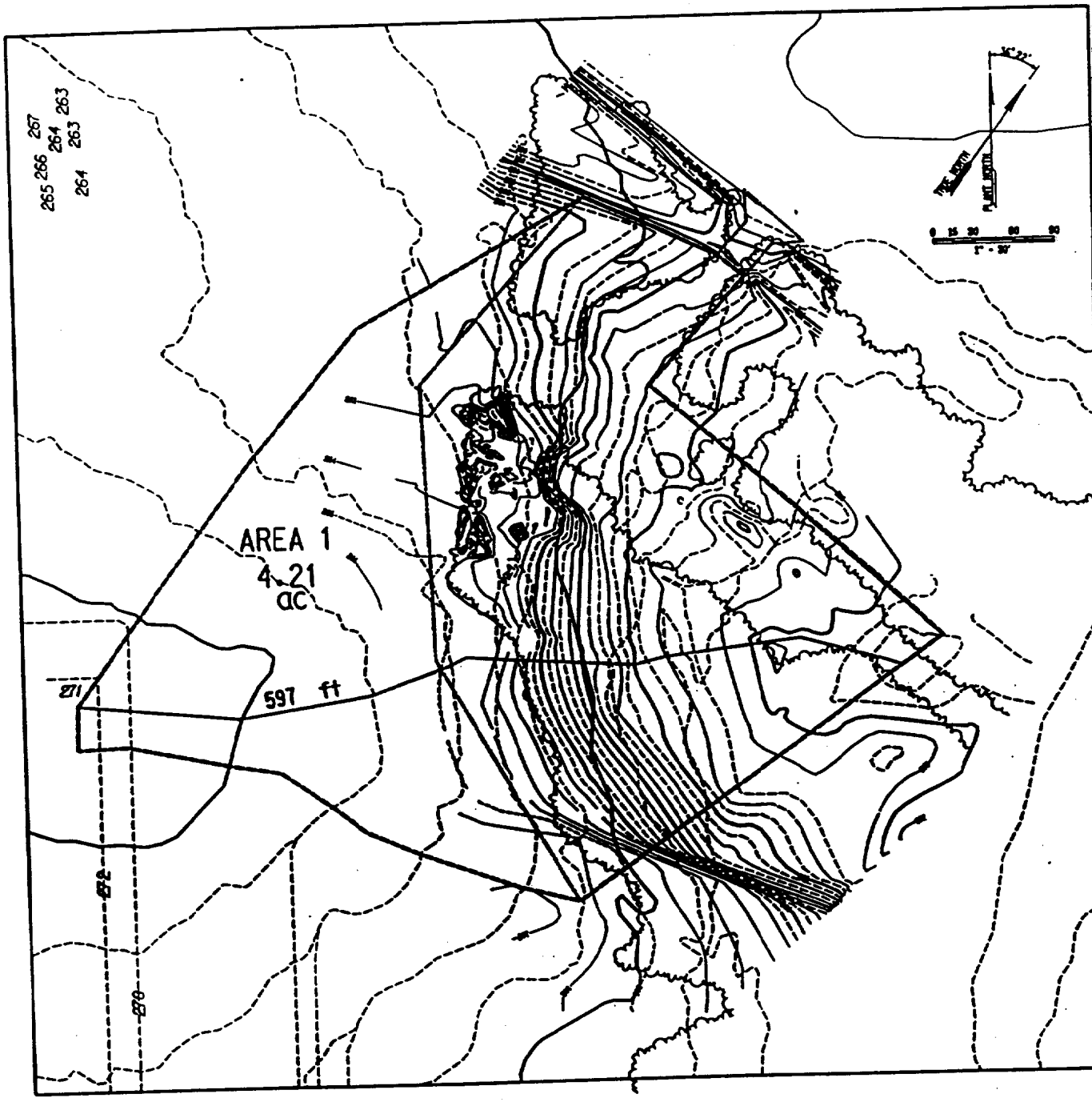


Figure 1. Pre Development

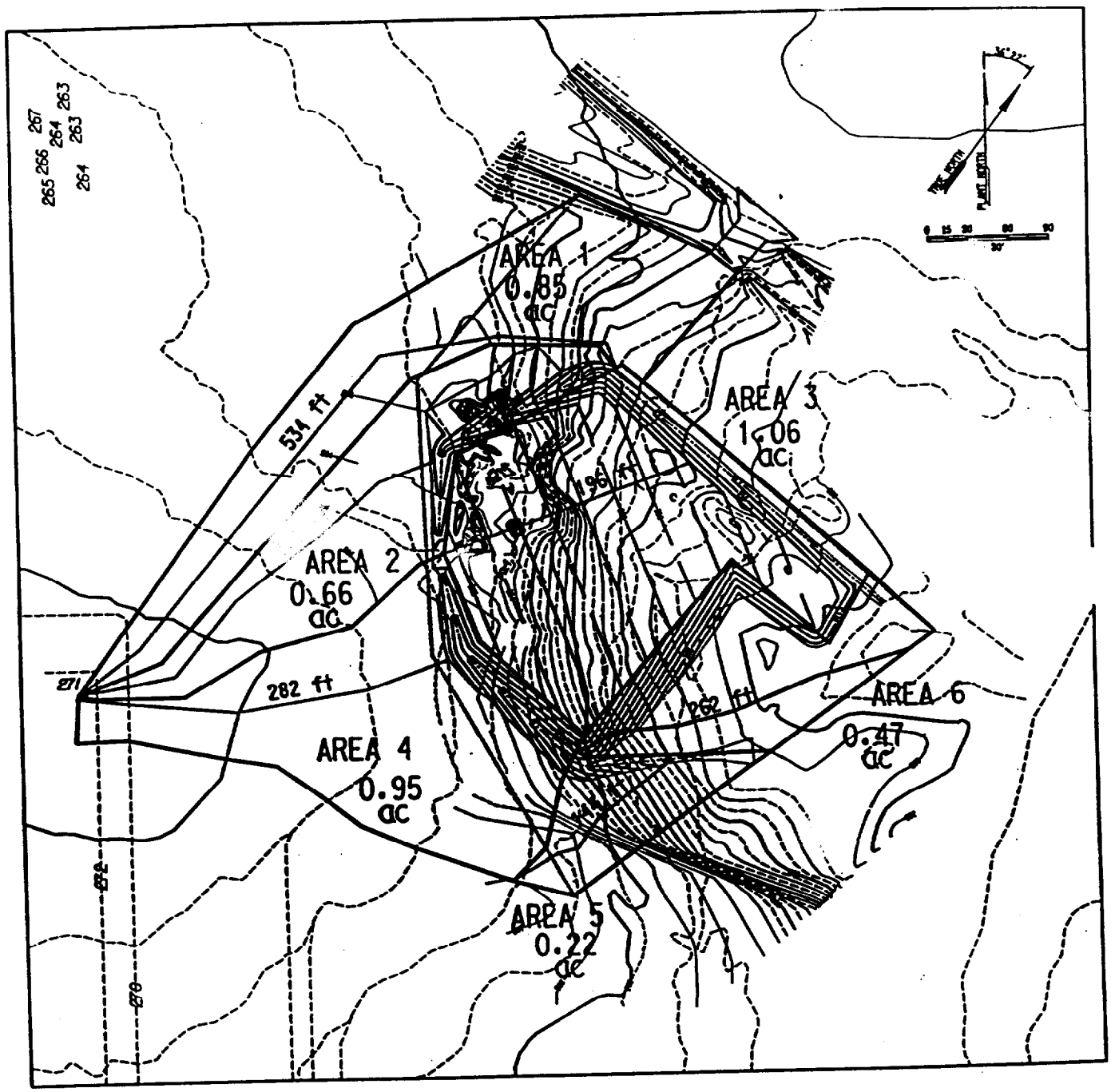


Figure 2. Post Development

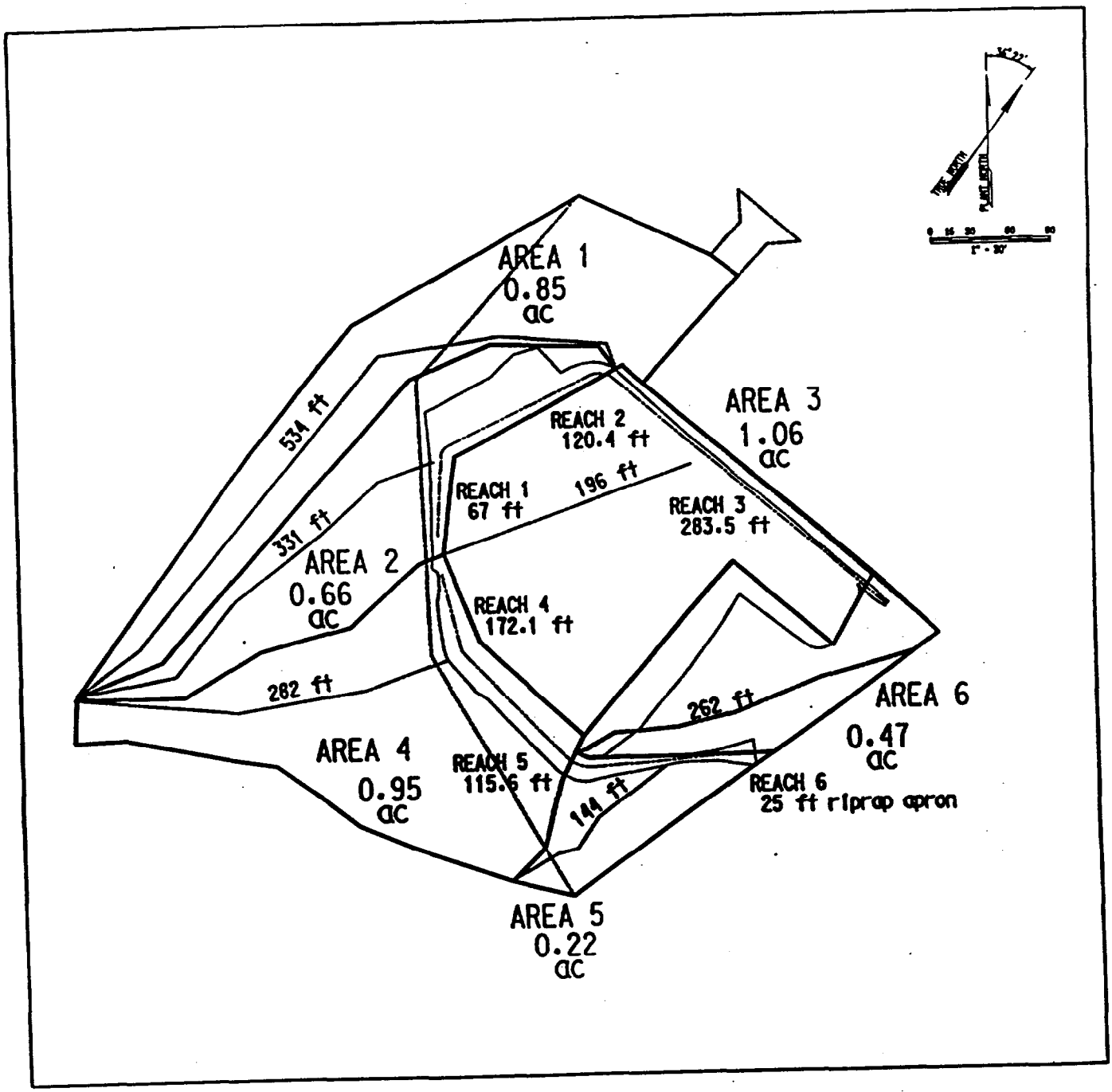
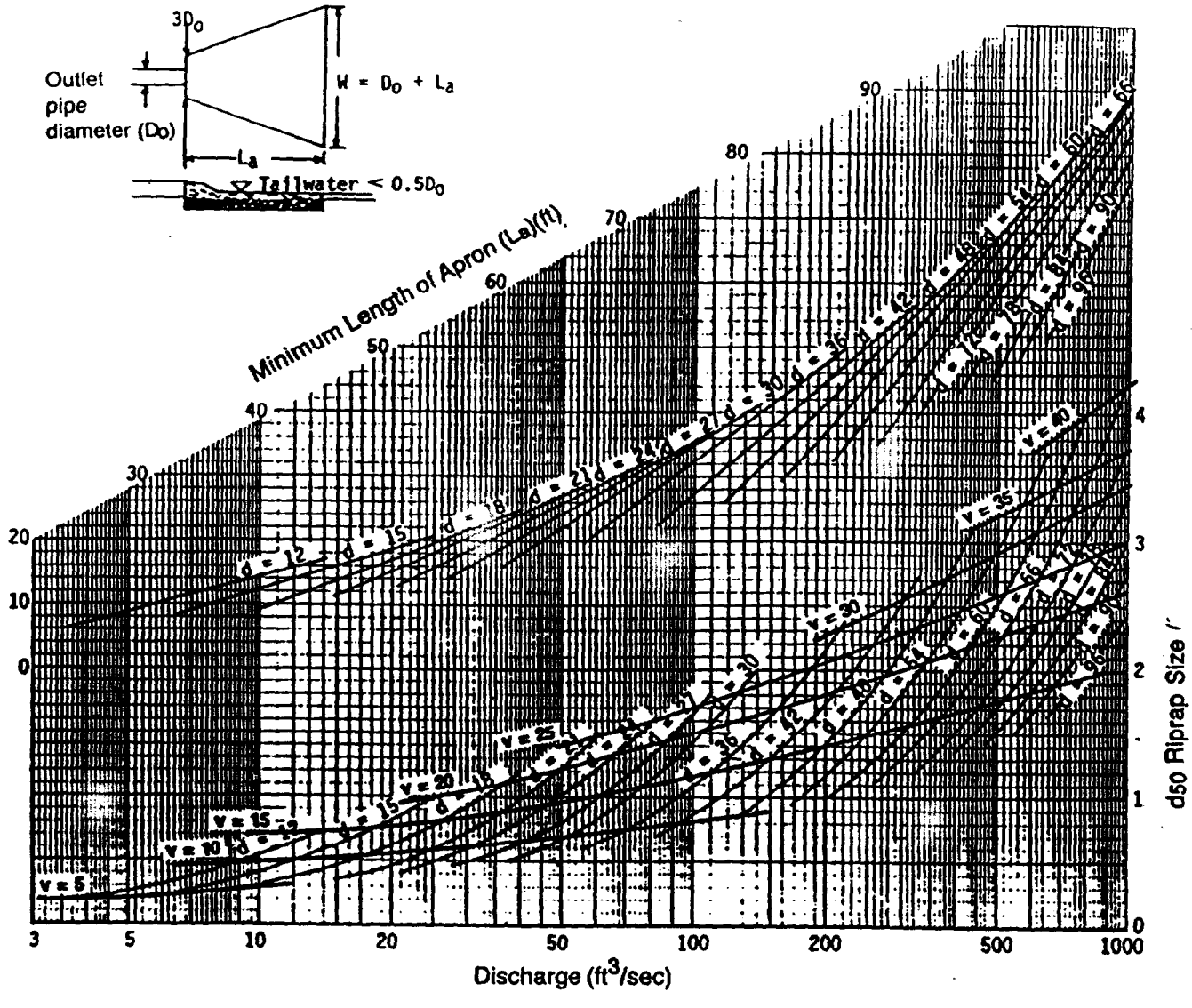


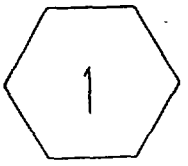
Figure 3. Post Development Areas and Reaches



Curves may not be extrapolated.

Figure 8.06a Design of outlet protection protection from a round pipe flowing full, minimum tailwater condition (T_w < 0.5 diameter).

WATERSHED ROUTING ==========



SUBCATCHMENT 1 **Total pre-development area**

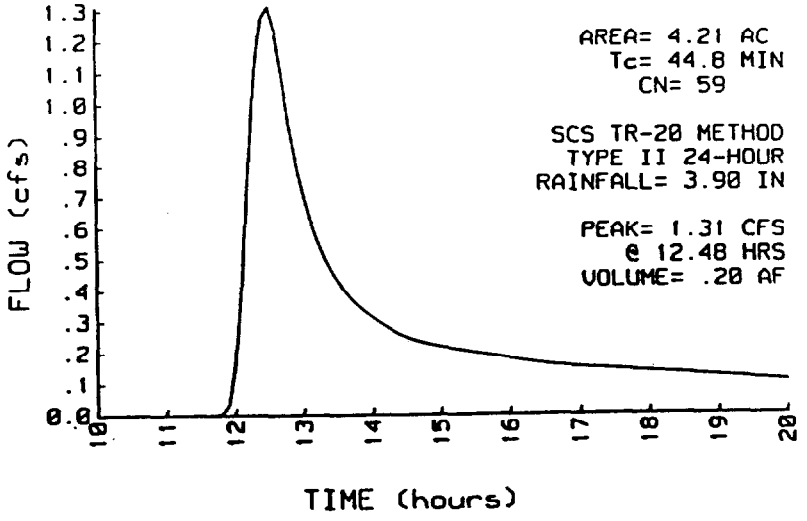
PEAK= 1.31 CFS @ 12.48 HRS, VOLUME= .20 AF

ACRES	CN	
1.50	60	Fair Woods
2.71	58	Meadow-mowed
4.21	59	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 3.90 IN
SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:**	41.1
Grass: Dense n=.24 L=300' P2=3.9 in s=.01 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:**	3.7
Woodland Kv=5 L=297' s=.07 '/' V=1.32 fps		
	Total Length= 597 ft **Total Tc=**	44.8

SUBCATCHMENT 1 RUNOFF
Total pre-development area



SUBCATCHMENT 1 **Total pre-development area**

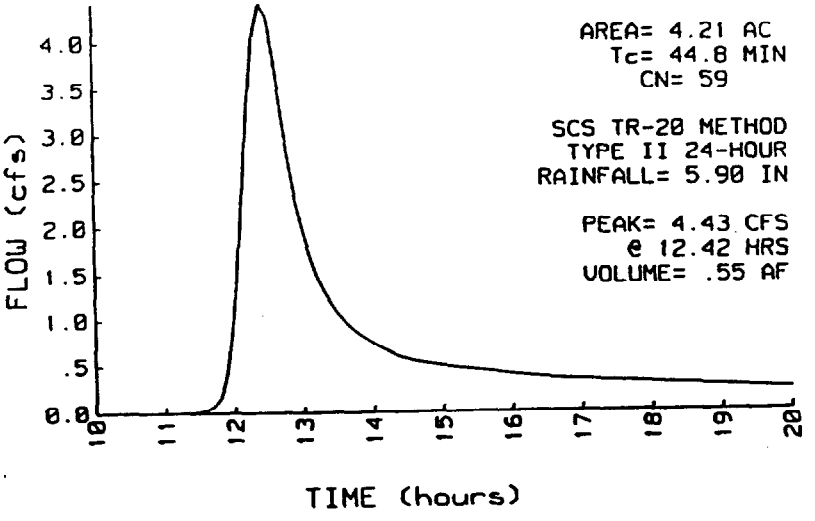
PEAK= 4.43 CFS @ 12.42 HRS, VOLUME= .55 AF

ACRES	CN	
1.50	60	Fair Woods
2.71	58	Meadow-mowed
4.21	59	

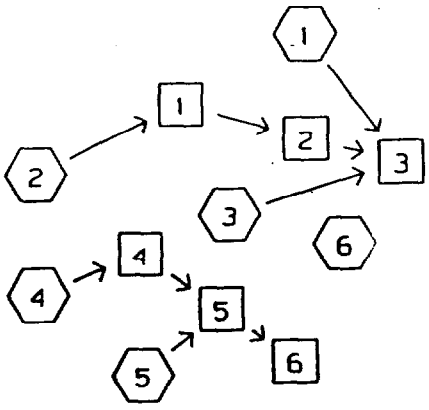
SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 5.90 IN
SPAN= 10-20 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:**	41.1
Grass: Dense n=.24 L=300' P2=3.9 in s=.01 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:**	3.7
Woodland Kv=5 L=297' s=.07 '/' V=1.32 fps		
	Total Length= 597 ft	**Total Tc= 44.8**

SUBCATCHMENT 1 RUNOFF
Total pre-development area



WATERSHED ROUTING



SUBCATCHMENT REACH POND LINK

SUBCATCHMENT 1 **Area 1**

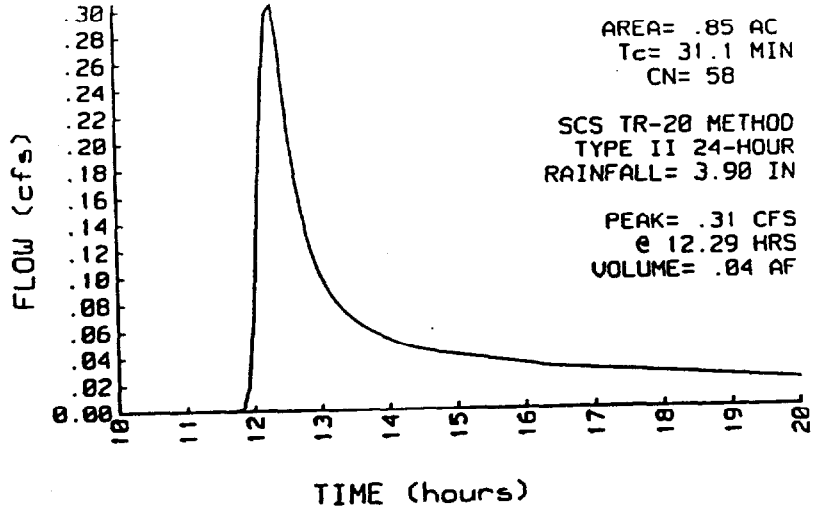
PEAK= .31 CFS @ 12.29 HRS, VOLUME= .04 AF

ACRES	CN	
.85	58	Meadow-mowed

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 3.90 IN
SPAN= 10-20 HRS, dt=.08 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:**	27.6
Grass: Dense n=.24 L=300' P2=3.9 in s=.027 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:**	3.5
Short Grass Pasture Kv=7 L=234' s=.026 '/' V=1.13 fps		
	Total Length= 534 ft **Total Tc=**	31.1

SUBCATCHMENT 1 RUNOFF
Area 1



SUBCATCHMENT 2 **Area 2**

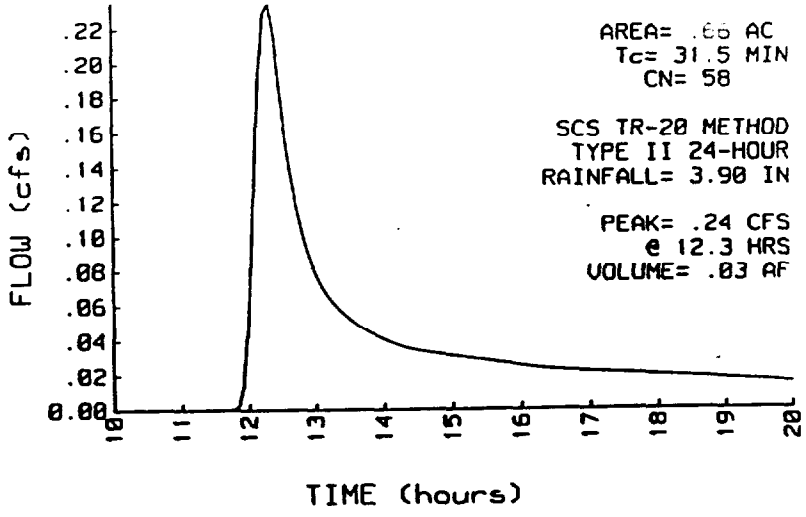
PEAK= .24 CFS @ 12.30 HRS, VOLUME= .03 AF

ACRES	CN	
.66	58	Meadow-mowed

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 3.90 IN
SPAN= 10-20 HRS, dt=.08 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:**	31.1
Grass: Dense n=.24 L=300' P2=3.9 in s=.02 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:**	.4
Short Grass Pasture Kv=7 L=31' s=.033 '/' V=1.27 fps		
	Total Length= 331 ft Total Tc=	31.5

SUBCATCHMENT 2 RUNOFF
Area 2



Data for Post KBRP/RP C-CLC-K-00284
TYPE II 24-HOUR RAINFALL= 3.90 IN

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SUBCATCHMENT 3 **Area 3**

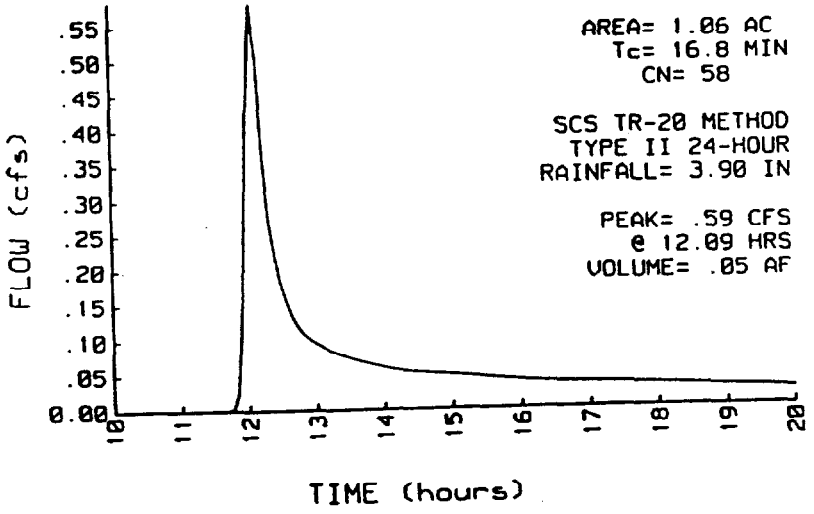
PEAK= .59 CFS @ 12.09 HRS, VOLUME= .05 AF

ACRES	CN	
1.06	58	Meadow-mowed

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 3.90 IN
SPAN= 10-20 HRS, dt=.08 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:**	16.8
Grass: Dense n=.24	L=196' P2=3.9 in s=.04 '/'	

SUBCATCHMENT 3 RUNOFF
Area 3



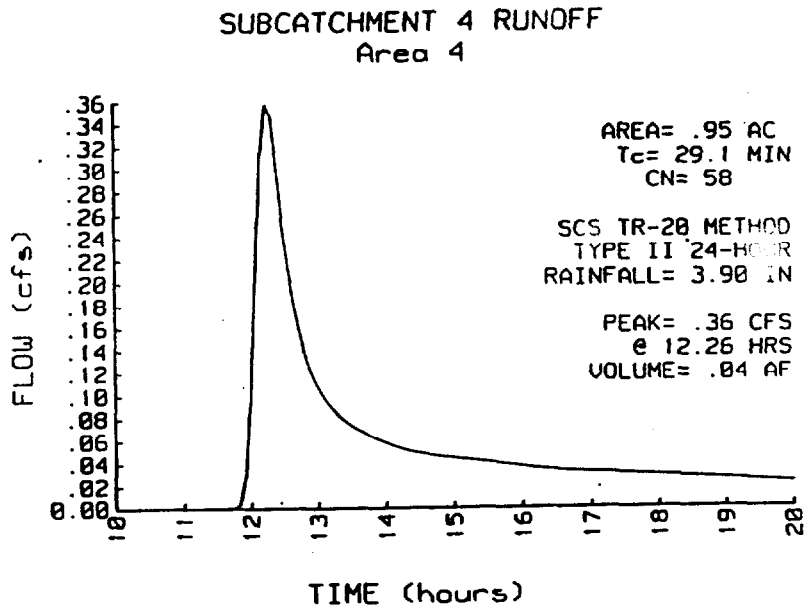
SUBCATCHMENT 4 **Area 4**

PEAK= .36 CFS @ 12.26 HRS, VOLUME= .04 AF

ACRES	CN	
.95	58	Meadow-mowed

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 3.90 IN
SPAN= 10-20 HRS, dt=.08 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:**	29.1
Grass: Dense n=.24 L=282' P2=3.9 in s=.021 '/'		



Data for Post KBRP/RP C-CLC-K-00284
TYPE II 24-HOUR RAINFALL= 3.90 IN

16 Oct 00

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SUBCATCHMENT 5 Area 5

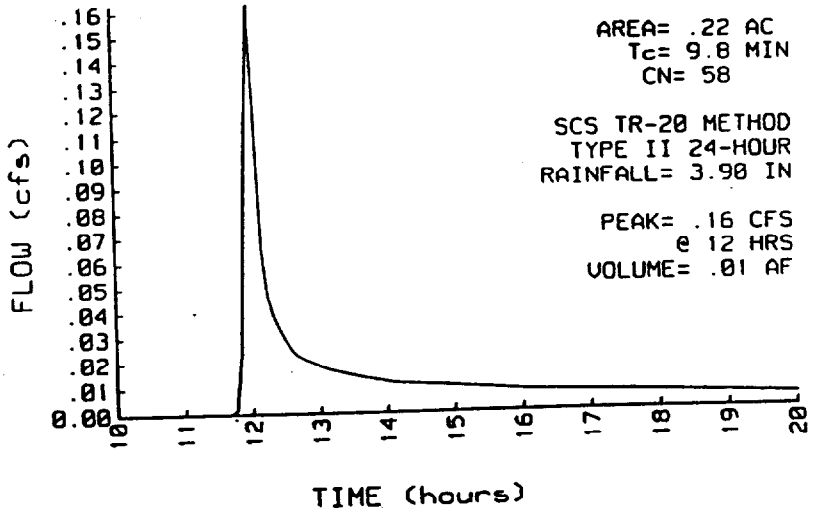
PEAK= .16 CFS @ 12.00 HRS, VOLUME= .01 AF

ACRES	CN	
.22	58	Meadow-mowed

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 3.90 IN
SPAN= 10-20 HRS, dt=.08 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:	9.8
Grass: Dense n=.24	L=144' P2=3.9 in s=.083 '/'	

SUBCATCHMENT 5 RUNOFF
Area 5



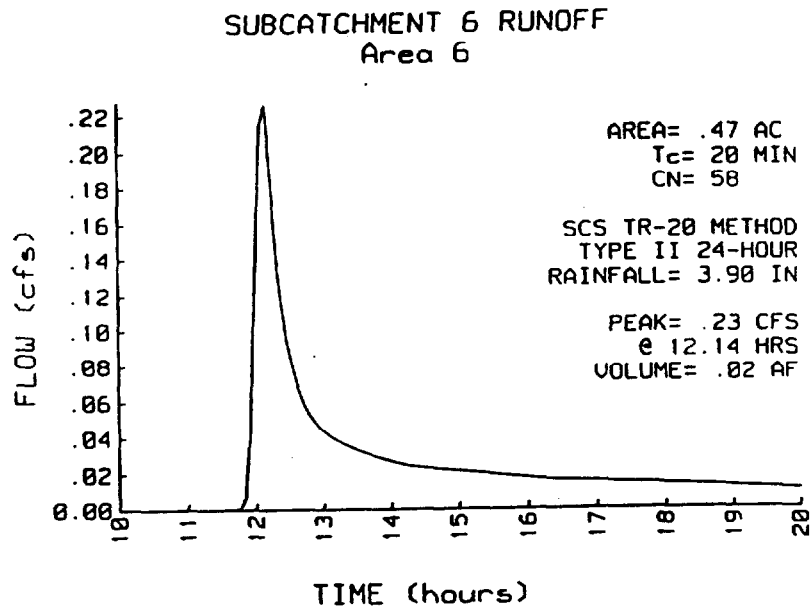
SUBCATCHMENT 6 **Area 6**

PEAK= .23 CFS @ 12.14 HRS, VOLUME= .02 AF

ACRES	CN	
.47	58	Meadow-mowed

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 3.90 IN
SPAN= 10-20 HRS, dt=.08 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:**	20.0
Grass: Dense n=.24 L=262' P2=3.9 in s=.046 '/'		



REACH 1 **North Channel - Grass - Segment 1**

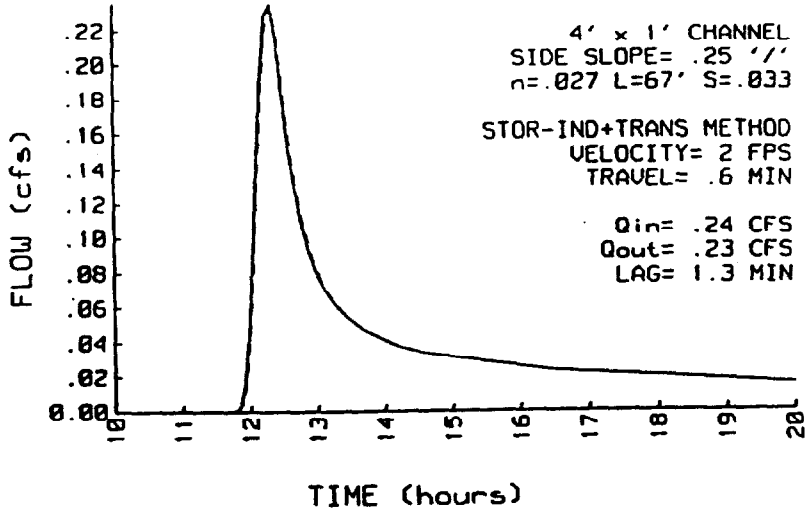
Qin = .24 CFS @ 12.30 HRS, VOLUME= .03 AF
Qout= .23 CFS @ 12.32 HRS, VOLUME= .03 AF, ATTEN= 1%, LAG= 1.3 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.00	0.00	0.00
.10	.44	.89
.20	.96	2.94
.30	1.56	6.04
.43	2.46	11.65
.60	3.84	21.84
.80	5.76	38.36
1.00	8.00	60.22

4' x 1' CHANNEL
SIDE SLOPE= .25 '/'
n= .027
LENGTH= 67 FT
SLOPE= .033 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .03 FT
PEAK VELOCITY= 2.0 FPS
TRAVEL TIME = .6 MIN
SPAN= 10-20 HRS, dt=.08 HRS

REACH 1 INFLOW & OUTFLOW
North Channel - Grass - Segment 1



REACH North Channel - Grass - Segment 2

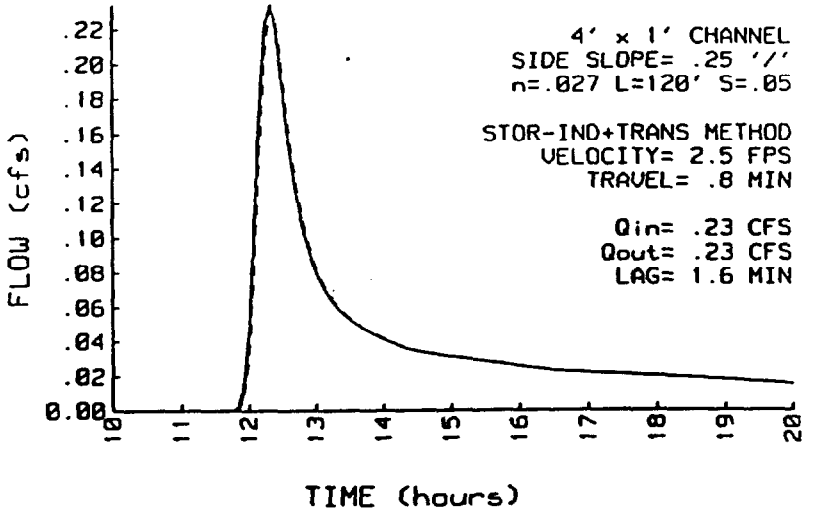
Qin = .23 CFS @ 12.32 HRS, VOLUME= .03 AF
Qout= .23 CFS @ 12.35 HRS, VOLUME= .03 AF, ATTEN= 1%, LAG= 1.6 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.00	0.00	0.00
.10	.44	1.10
.20	.96	3.62
.30	1.56	7.43
.43	2.46	14.34
.60	3.84	26.89
.80	5.76	47.21
1.00	8.00	74.12

4' x 1' CHANNEL
SIDE SLOPE= .25 '/'
n= .027
LENGTH= 120 FT
SLOPE= .05 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .02 FT
PEAK VELOCITY= 2.5 FPS
TRAVEL TIME = .8 MIN
SPAN= 10-20 HRS, dt=.08 HRS

REACH 2 INFLOW & OUTFLOW
North Channel - Grass - Segment 2



REACH 3 **North Channel - Grass - Segment 3**

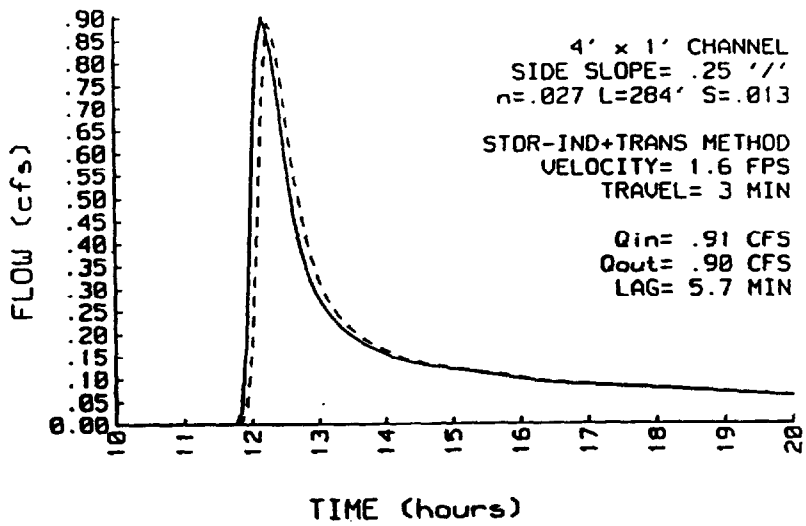
Qin = .91 CFS @ 12.18 HRS, VOLUME= .11 AF
Qout= .90 CFS @ 12.27 HRS, VOLUME= .11 AF, ATTEN= 0%, LAG= 5.7 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.00	0.00	0.00
.10	.44	.56
.20	.96	1.85
.30	1.56	3.79
.43	2.46	7.31
.60	3.84	13.71
.80	5.76	24.07
1.00	8.00	37.80

4' x 1' CHANNEL
SIDE SLOPE= .25 '/'
n= .027
LENGTH= 284 FT
SLOPE= .013 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .13 FT
PEAK VELOCITY= 1.6 FPS
TRAVEL TIME = 3.0 MIN
SPAN= 10-20 HRS, dt=.08 HRS

REACH 3 INFLOW & OUTFLOW
North Channel - Grass - Segment 3



REACH 4 South Channel - Grass Segment 1

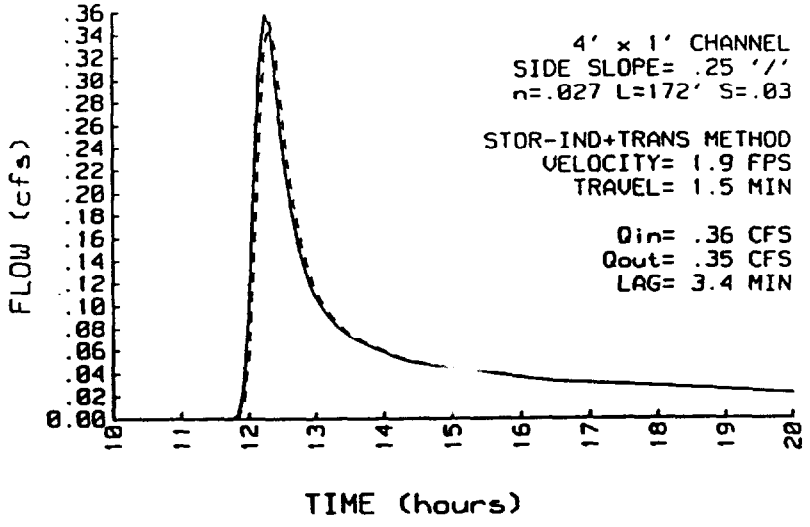
Qin = .36 CFS @ 12.26 HRS, VOLUME= .04 AF
Qout= .35 CFS @ 12.32 HRS, VOLUME= .04 AF, ATTEN= 2%, LAG= 3.4 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.00	0.00	0.00
.10	.44	.85
.20	.96	2.81
.30	1.56	5.76
.43	2.46	11.10
.60	3.84	20.83
.80	5.76	36.57
1.00	8.00	57.42

4' x 1' CHANNEL
SIDE SLOPE= .25 '/'
n= .027
LENGTH= 172 FT
SLOPE= .03 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .04 FT
PEAK VELOCITY= 1.9 FPS
TRAVEL TIME = 1.5 MIN
SPAN= 10-20 HRS, dt=.08 HRS

REACH 4 INFLOW & OUTFLOW
South Channel - Grass - Segment 1



REACH 5 **South Channel - Grass - Segment 2**

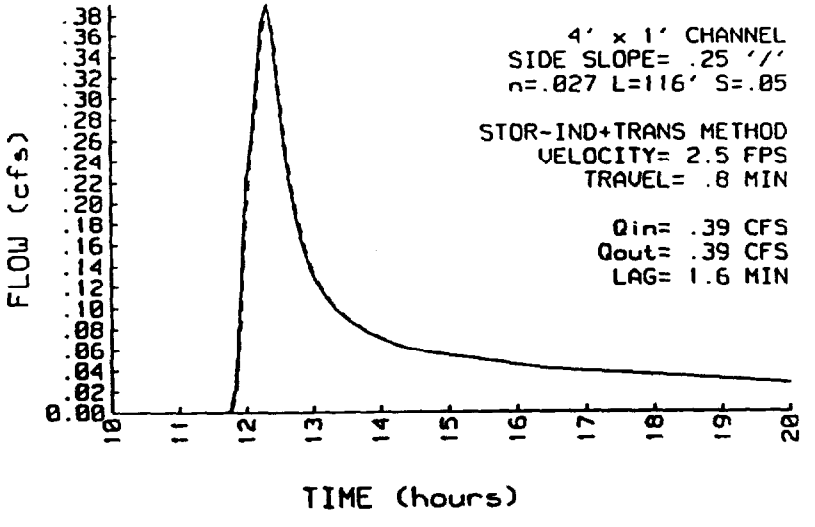
Qin = .39 CFS @ 12.31 HRS, VOLUME= .05 AF
Qout= .39 CFS @ 12.34 HRS, VOLUME= .05 AF, ATTEN= 1%, LAG= 1.6 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.00	0.00	0.00
.10	.44	1.10
.20	.96	3.62
.30	1.56	7.43
.43	2.46	14.34
.60	3.84	26.89
.80	5.76	47.21
1.00	8.00	74.12

4' x 1' CHANNEL
SIDE SLOPE= .25 '/'
n= .027
LENGTH= 116 FT
SLOPE= .05 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .04 FT
PEAK VELOCITY= 2.5 FPS
TRAVEL TIME = .8 MIN
SPAN= 10-20 HRS, dt=.08 HRS

REACH 5 INFLOW & OUTFLOW
South Channel - Grass - Segment 2



REACH 6 Riprap Apron

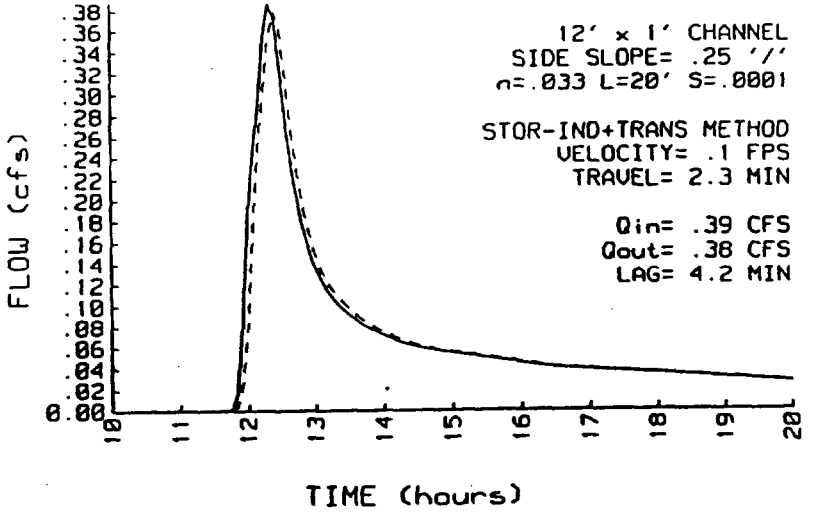
Qin = .39 CFS @ 12.34 HRS, VOLUME= .05 AF
Qout= .38 CFS @ 12.41 HRS, VOLUME= .05 AF, ATTEN= 2%, LAG= 4.2 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.00	0.00	0.00
.10	1.24	.12
.20	2.56	.38
.30	3.96	.75
.43	5.90	1.39
.60	8.64	2.48
.80	12.16	4.13
1.00	16.00	6.16

12' x 1' CHANNEL
SIDE SLOPE= .25 '/'
n= .033
LENGTH= 20 FT
SLOPE= .0001 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .20 FT
PEAK VELOCITY= .1 FPS
TRAVEL TIME = 2.3 MIN
SPAN= 10-20 HRS, dt=.08 HRS

REACH 6 INFLOW & OUTFLOW
Riprap Apron



SUBCATCHMENT 1 **Area 1**

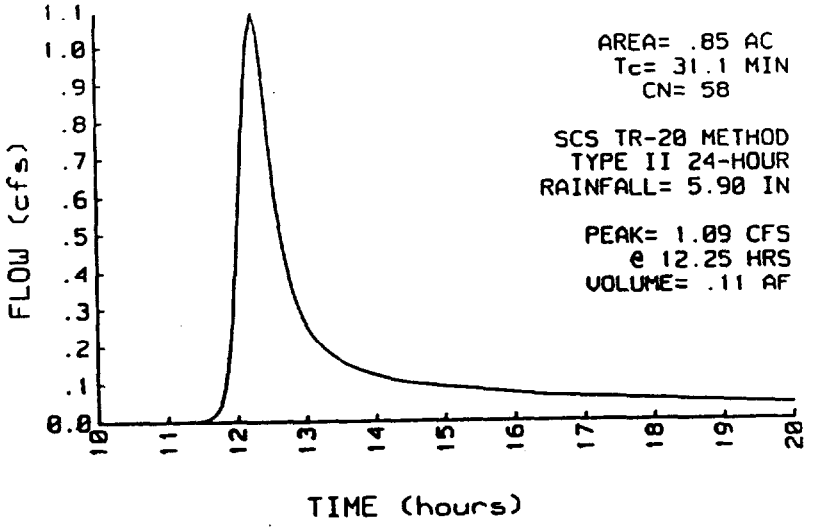
PEAK= 1.09 CFS @ 12.25 HRS, VOLUME= .11 AF

ACRES	CN	
.85	58	Meadow-mowed

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 5.90 IN
SPAN= 10-20 HRS, dt=.08 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:**	27.6
Grass: Dense n=.24 L=300' P2=3.9 in s=.027 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:**	3.5
Short Grass Pasture Kv=7 L=234' s=.026 '/' V=1.13 fps		
	Total Length= 534 ft	**Total Tc= 31.1**

SUBCATCHMENT 1 RUNOFF
Area 1



SUBCATCHMENT 2 Area 2

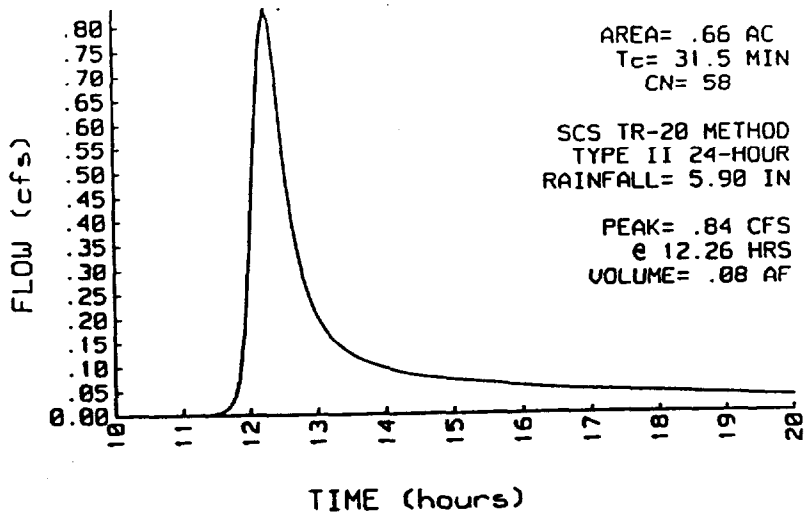
PEAK= .84 CFS @ 12.26 HRS, VOLUME= .08 AF

ACRES	CN	
.66	58	Meadow-mowed

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 5.90 IN
SPAN= 10-20 HRS, dt=.08 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:	31.1
Grass: Dense n=.24 L=300' P2=3.9 in s=.02 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	Segment ID:	.4
Short Grass Pasture Kv=7 L=31' s=.033 '/' V=1.27 fps		
	Total Length= 331 ft Total Tc=	31.5

SUBCATCHMENT 2 RUNOFF
Area 2



Data for Post KBRP/RP C-CLC-K-00284
TYPE II 24-HOUR RAINFALL= 5.90 IN

16 Oct 00

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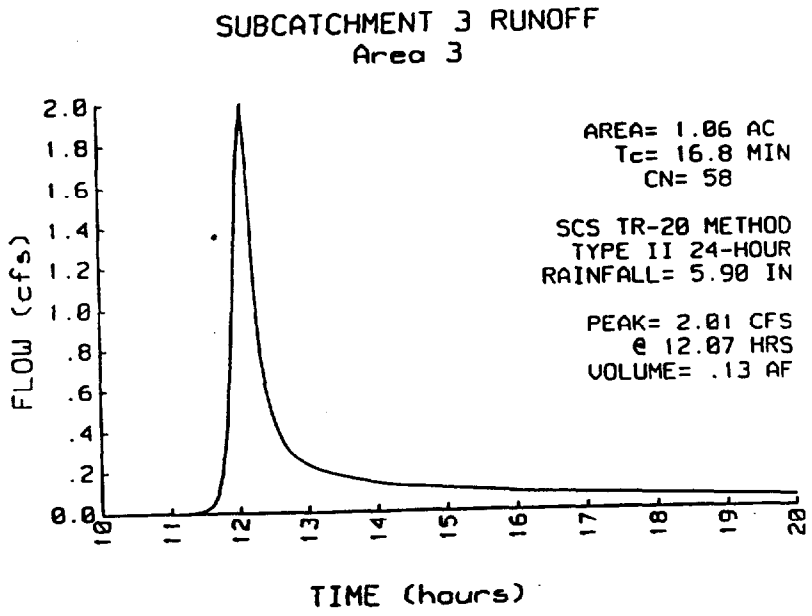
SUBCATCHMENT 3 Area 3

PEAK= 2.01 CFS @ 12.07 HRS, VOLUME= .13 AF

ACRES	CN	
1.06	58	Meadow-mowed

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 5.90 IN
SPAN= 10-20 HRS, dt=.08 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	Segment ID:	16.8
Grass: Dense n=.24 L=196' P2=3.9 in s=.04 '/'		



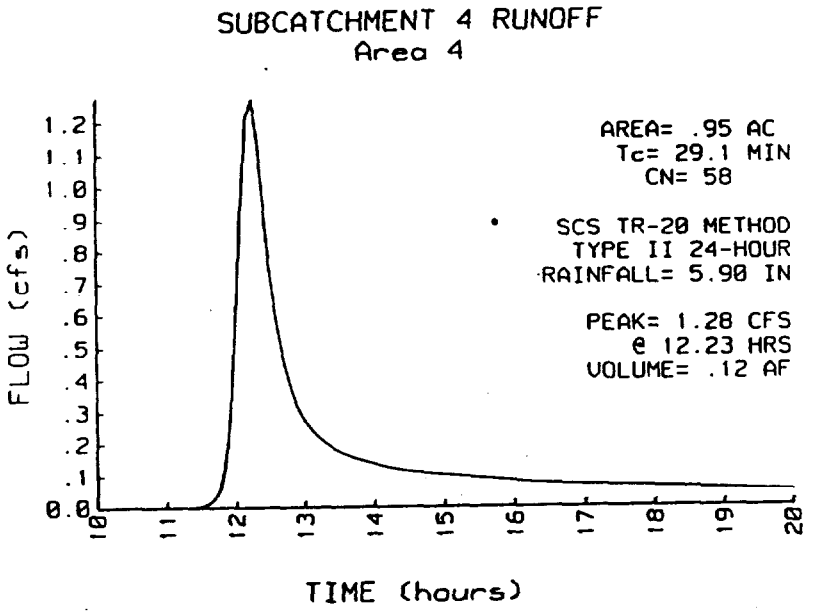
SUBCATCHMENT 4 **Area 4**

PEAK= 1.28 CFS @ 12.23 HRS, VOLUME= .12 AF

ACRES	CN	
.95	58	Meadow-mowed

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 5.90 IN
SPAN= 10-20 HRS, dt=.08 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:**	29.1
Grass: Dense n=.24 L=282' P2=3.9 in s=.021 '/'		



SUBCATCHMENT 5 **Area 5**

PEAK= .53 CFS @ 11.99 HRS, VOLUME= .03 AF

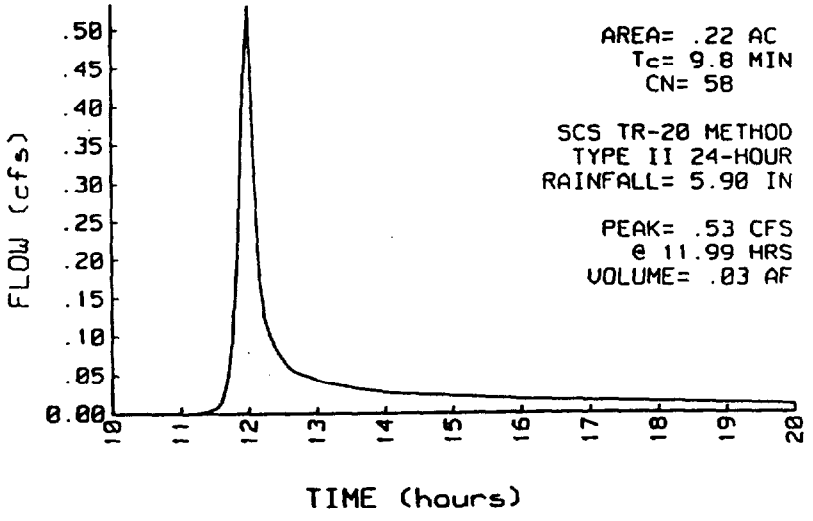
ACRES	CN	
.22	58	Meadow-mowed

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 5.90 IN
SPAN= 10-20 HRS, dt=.08 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:**	9.8

Grass: Dense n=.24 L=144' P2=3.9 in s=.083 '/'

SUBCATCHMENT 5 RUNOFF
Area 5



SUBCATCHMENT 6 **Area 6**

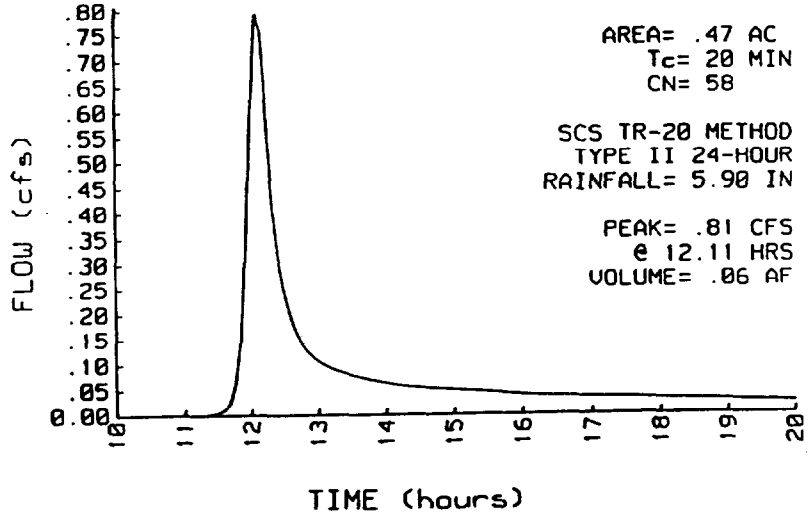
PEAK= .81 CFS @ 12.11 HRS, VOLUME= .06 AF

ACRES	CN	
.47	58	Meadow-mowed

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 5.90 IN
SPAN= 10-20 HRS, dt=.08 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:**	20.0
Grass: Dense n=.24 L=262' P2=3.9 in s=.046 '/'		

SUBCATCHMENT 6 RUNOFF
Area 6



REACH 1 **North Channel - Grass - Segment 1**

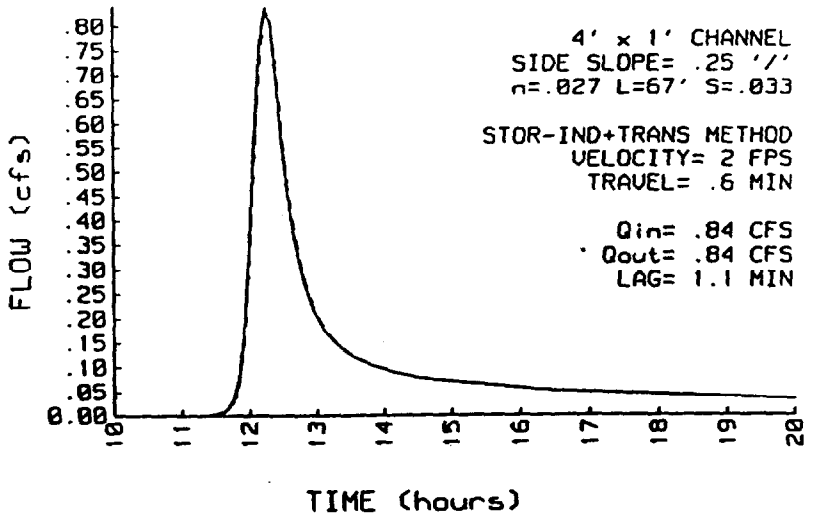
Qin = .84 CFS @ 12.26 HRS, VOLUME= .08 AF
Qout= .84 CFS @ 12.27 HRS, VOLUME= .08 AF, ATTEN= 1%, LAG= 1.1 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.00	0.00	0.00
.10	.44	.89
.20	.96	2.94
.30	1.56	6.04
.43	2.46	11.65
.60	3.84	21.84
.80	5.76	38.36
1.00	8.00	60.22

4' x 1' CHANNEL
SIDE SLOPE= .25 '/'
n= .027
LENGTH= 67 FT
SLOPE= .033 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .09 FT
PEAK VELOCITY= 2.0 FPS
TRAVEL TIME = .6 MIN
SPAN= 10-20 HRS, dt=.08 HRS

REACH 1 INFLOW & OUTFLOW
North Channel - Grass - Segment 1



REACH 2 North Channel - Grass - Segment 2

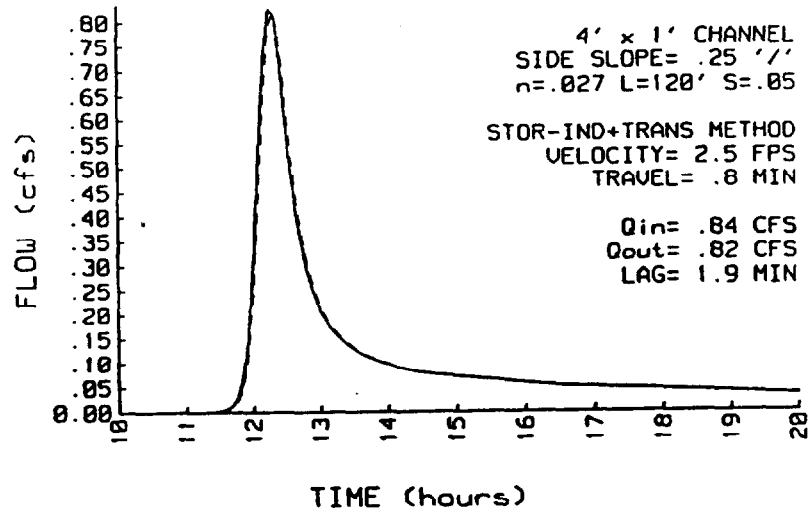
Qin = .84 CFS @ 12.27 HRS, VOLUME= .08 AF
Qout= .82 CFS @ 12.30 HRS, VOLUME= .08 AF, ATTEN= 1%, LAG= 1.9 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.00	0.00	0.00
.10	.44	1.10
.20	.96	3.62
.30	1.56	7.43
.43	2.46	14.34
.60	3.84	26.89
.80	5.76	47.21
1.00	8.00	74.12

4' x 1' CHANNEL
SIDE SLOPE= .25 '/'
n= .027
LENGTH= 120 FT
SLOPE= .05 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .08 FT
PEAK VELOCITY= 2.5 FPS
TRAVEL TIME = .8 MIN
SPAN= 10-20 HRS, dt=.08 HRS

REACH 2 INFLOW & OUTFLOW
North Channel - Grass - Segment 2



REACH 3 **North Channel - Grass - Segment 3**

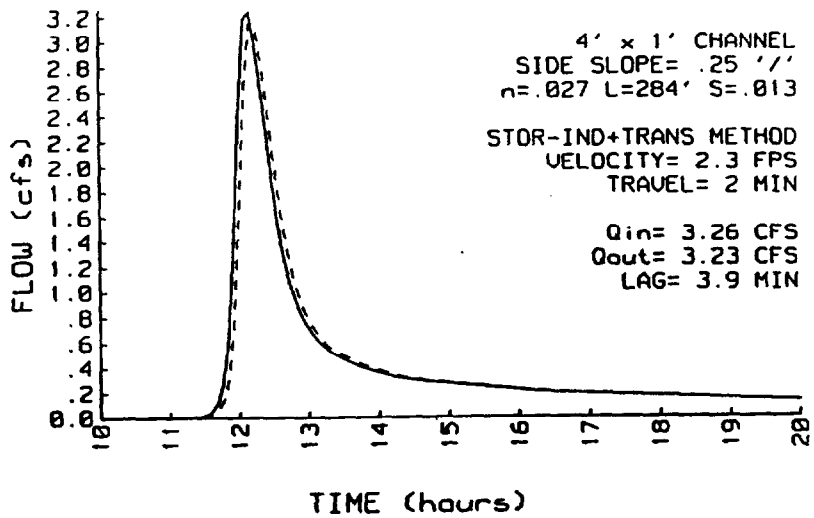
Qin = 3.26 CFS @ 12.13 HRS, VOLUME= .32 AF
Qout= 3.23 CFS @ 12.20 HRS, VOLUME= .32 AF, ATTEN= 1%, LAG= 3.9 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.00	0.00	0.00
.10	.44	.56
.20	.96	1.85
.30	1.56	3.79
.43	2.46	7.31
.60	3.84	13.71
.80	5.76	24.07
1.00	8.00	37.80

4' x 1' CHANNEL
SIDE SLOPE= .25 '/'
n= .027
LENGTH= 284 FT
SLOPE= .013 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .27 FT
PEAK VELOCITY= 2.3 FPS
TRAVEL TIME = 2.0 MIN
SPAN= 10-20 HRS, dt=.08 HRS

REACH 3 INFLOW & OUTFLOW
North Channel - Grass - Segment 3



REACH 4 South Channel - Grass - Segment 1

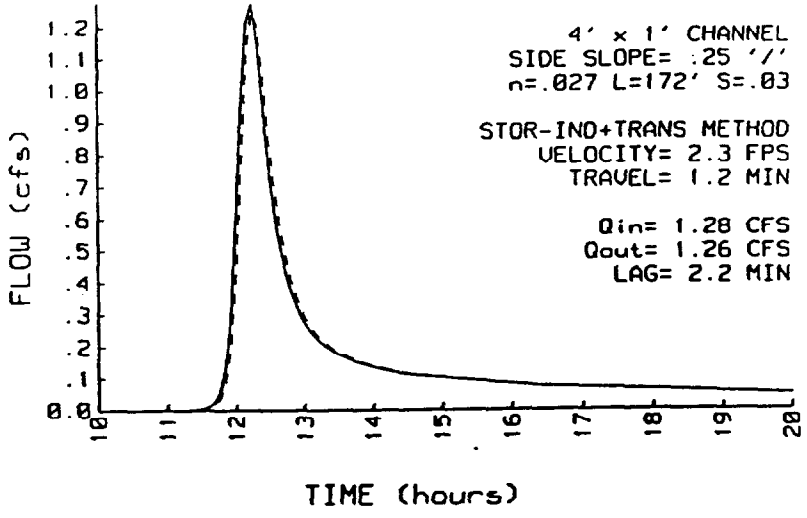
Qin = 1.28 CFS @ 12.23 HRS, VOLUME= .12 AF
Qout= 1.26 CFS @ 12.26 HRS, VOLUME= .12 AF, ATTEN= 2%, LAG= 2.2 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.00	0.00	0.00
.10	.44	.85
.20	.96	2.81
.30	1.56	5.76
.43	2.46	11.10
.60	3.84	20.83
.80	5.76	36.57
1.00	8.00	57.42

4' x 1' CHANNEL
SIDE SLOPE= .25 '/'
n= .027
LENGTH= 172 FT
SLOPE= .03 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .12 FT
PEAK VELOCITY= 2.3 FPS
TRAVEL TIME = 1.2 MIN
SPAN= 10-20 HRS, dt=.08 HRS

REACH 4 INFLOW & OUTFLOW
South Channel - Grass - Segment 1



REACH 5 **South Channel - Grass - Segment 2**

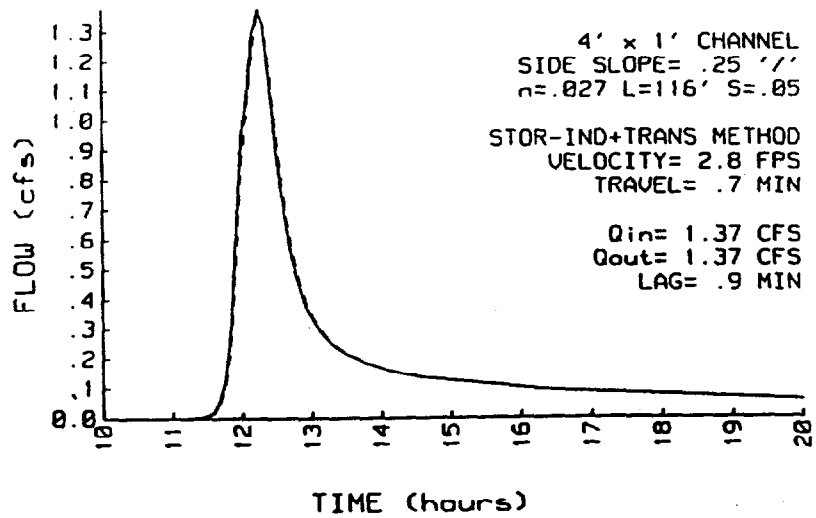
Qin = 1.37 CFS @ 12.24 HRS, VOLUME= .15 AF
Qout= 1.37 CFS @ 12.26 HRS, VOLUME= .15 AF, ATTEN= 0%, LAG= .9 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.00	0.00	0.00
.10	.44	1.10
.20	.96	3.62
.30	1.56	7.43
.43	2.46	14.34
.60	3.84	26.89
.80	5.76	47.21
1.00	8.00	74.12

4' x 1' CHANNEL
SIDE SLOPE= .25 '/'
n= .027
LENGTH= 116 FT
SLOPE= .05 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .11 FT
PEAK VELOCITY= 2.8 FPS
TRAVEL TIME = .7 MIN
SPAN= 10-20 HRS, dt=.08 HRS

REACH 5 INFLOW & OUTFLOW
South Channel - Grass - Segment 2



REACH 6 Riprap Apron

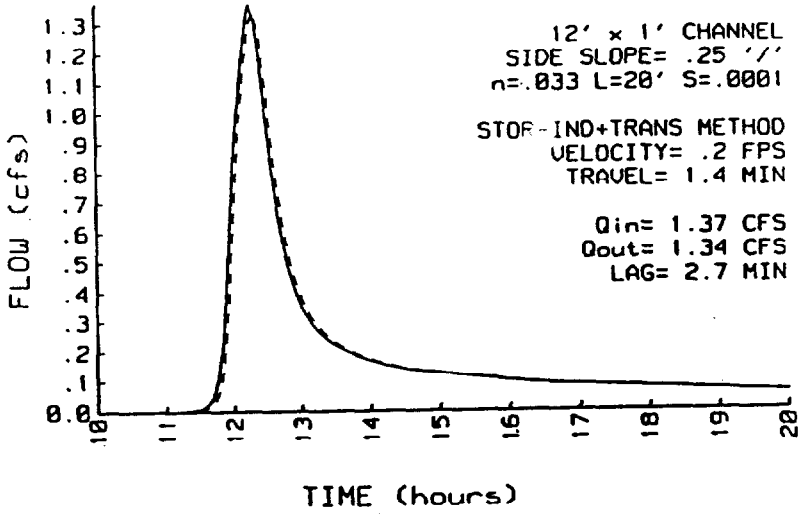
Qin = 1.37 CFS @ 12.26 HRS, VOLUME= .15 AF
Qout= 1.34 CFS @ 12.30 HRS, VOLUME= .15 AF, ATTEN= 2%, LAG= 2.7 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.00	0.00	0.00
.10	1.24	.12
.20	2.56	.38
.30	3.96	.75
.43	5.90	1.39
.60	8.64	2.48
.80	12.16	4.13
1.00	16.00	6.16

12' x 1' CHANNEL
SIDE SLOPE= .25 '/'
n= .033
LENGTH= 20 FT
SLOPE= .0001 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .42 FT
PEAK VELOCITY= .2 FPS
TRAVEL TIME = 1.4 MIN
SPAN= 10-20 HRS, dt=.08 HRS

REACH 6 INFLOW & OUTFLOW
Riprap Apron



REACH 1 North Channel - Grass - Segment 1

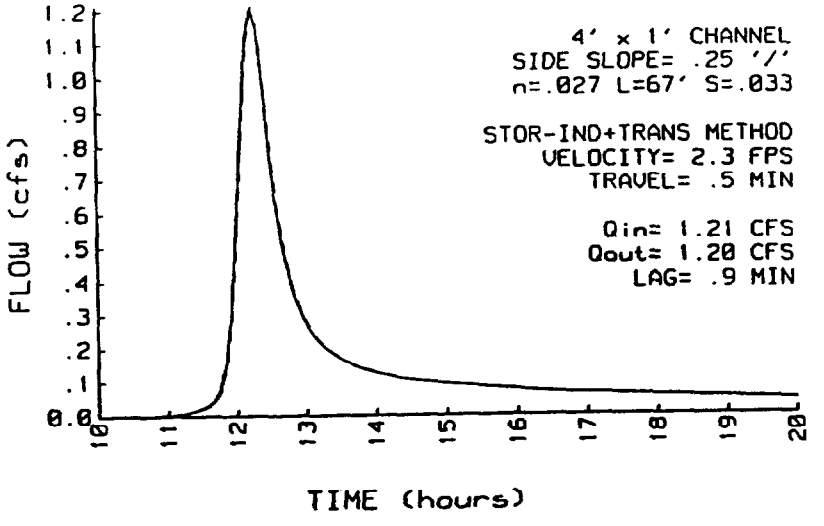
Qin = 1.21 CFS @ 12.25 HRS, VOLUME= .12 AF
Qout= 1.20 CFS @ 12.26 HRS, VOLUME= .12 AF, ATTEN= 1%, LAG= .9 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.00	0.00	0.00
.10	.44	.89
.20	.96	2.94
.30	1.56	6.04
.43	2.46	11.65
.60	3.84	21.84
.80	5.76	38.36
1.00	8.00	60.22

4' x 1' CHANNEL
SIDE SLOPE= .25 '/'
n= .027
LENGTH= 67 FT
SLOPE= .033 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .12 FT
PEAK VELOCITY= 2.3 FPS
TRAVEL TIME = .5 MIN
SPAN= 10-20 HRS, dt=.08 HRS

REACH 1 INFLOW & OUTFLOW
North Channel - Grass - Segment 1



REACH 2 North Channel - Grass - Segment 2

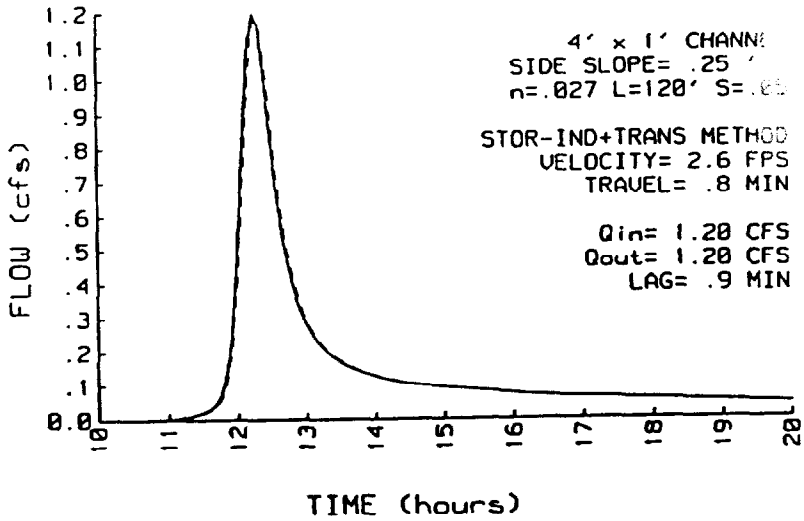
Qin = 1.20 CFS @ 12.26 HRS, VOLUME= .12 AF
Qout= 1.20 CFS @ 12.28 HRS, VOLUME= .12 AF, ATTEN= 0%, LAG= .9 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.00	0.00	0.00
.10	.44	1.10
.20	.96	3.62
.30	1.56	7.43
.43	2.46	14.34
.60	3.84	26.89
.80	5.76	47.21
1.00	8.00	74.12

4' x 1' CHANNEL
SIDE SLOPE= .25 '/'
n= .027
LENGTH= 120 FT
SLOPE= .05 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .10 FT
PEAK VELOCITY= 2.6 FPS
TRAVEL TIME = .8 MIN
SPAN= 10-20 HRS, dt=.08 HRS

REACH 2 INFLOW & OUTFLOW
North Channel - Grass - Segment 2



REACH 3 **North Channel - Grass - Segment 3**

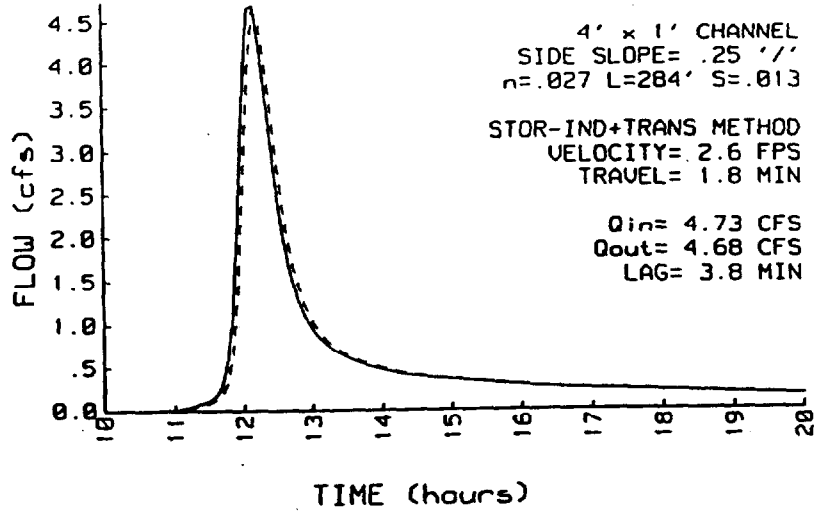
Qin = 4.73 CFS @ 12.12 HRS, VOLUME= .45 AF
Qout= 4.68 CFS @ 12.19 HRS, VOLUME= .45 AF, ATTEN= 1%, LAG= 3.8 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.00	0.00	0.00
.10	.44	.56
.20	.96	1.85
.30	1.56	3.79
.43	2.46	7.31
.60	3.84	13.71
.80	5.76	24.07
1.00	8.00	37.80

4' x 1' CHANNEL
SIDE SLOPE= .25 '/'
n= .027
LENGTH= 284 FT
SLOPE= .013 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .34 FT
PEAK VELOCITY= 2.6 FPS
TRAVEL TIME = 1.8 MIN
SPAN= 10-20 HRS, dt=.08 HRS

REACH 3 INFLOW & OUTFLOW
North Channel - Grass - Segment 3



REACH 4 South Channel Grass - Segment 1

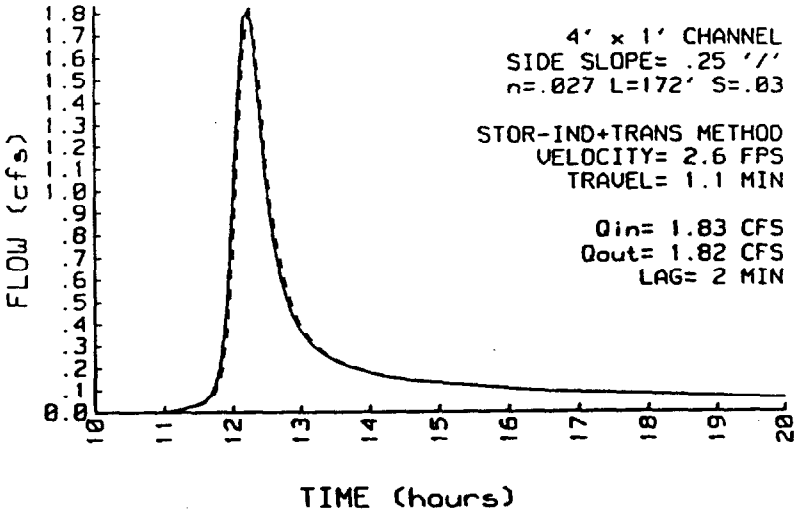
Qin = 1.83 CFS @ 12.22 HRS, VOLUME= .17 AF
Qout= 1.82 CFS @ 12.25 HRS, VOLUME= .17 AF, ATTEN= 1%, LAG= 2.0 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.00	0.00	0.00
.10	.44	.85
.20	.96	2.81
.30	1.56	5.76
.43	2.46	11.10
.60	3.84	20.83
.80	5.76	36.57
1.00	8.00	57.42

4' x 1' CHANNEL
SIDE SLOPE= .25 '/'
n= .027
LENGTH= 172 FT
SLOPE= .03 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .15 FT
PEAK VELOCITY= 2.6 FPS
TRAVEL TIME = 1.1 MIN
SPAN= 10-20 HRS, dt=.08 HRS

REACH 4 INFLOW & OUTFLOW
South Channel - Grass - Segment 1



REACH 5 **South Channel - Grass - Segment 2**

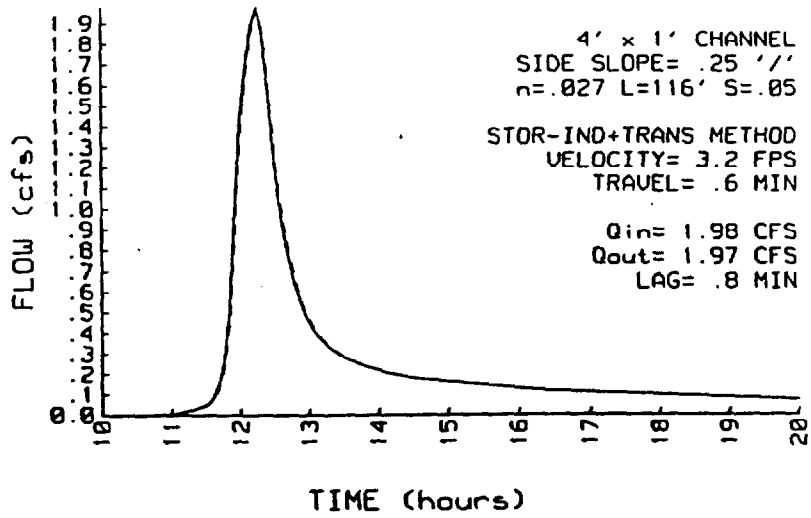
Qin = 1.98 CFS @ 12.23 HRS, VOLUME= .20 AF
Qout= 1.97 CFS @ 12.25 HRS, VOLUME= .20 AF, ATTEN= 1%, LAG= .8 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.00	0.00	0.00
.10	.44	1.10
.20	.96	3.62
.30	1.56	7.43
.43	2.46	14.34
.60	3.84	26.89
.80	5.76	47.21
1.00	8.00	74.12

4' x 1' CHANNEL
SIDE SLOPE= .25 '/'
n= .027
LENGTH= 116 FT
SLOPE= .05 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .13 FT
PEAK VELOCITY= 3.2 FPS
TRAVEL TIME = .6 MIN
SPAN= 10-20 HRS, dt=.08 HRS

REACH 5 INFLOW & OUTFLOW
South Channel - Grass - Segment 2



REACH 6 Riprap Apron

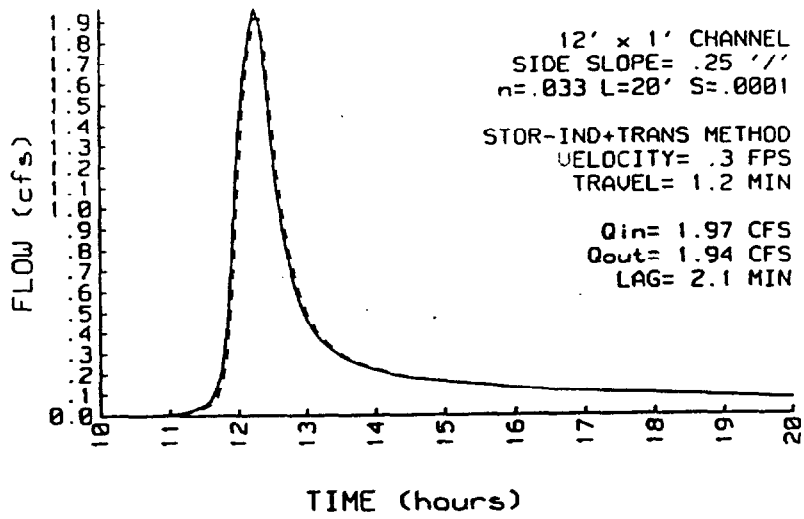
Qin = 1.97 CFS @ 12.25 HRS, VOLUME= .20 AF
Qout= 1.94 CFS @ 12.28 HRS, VOLUME= .20 AF, ATTEN= 1%, LAG= 2.1 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.00	0.00	0.00
.10	1.24	.12
.20	2.56	.38
.30	3.96	.75
.43	5.90	1.39
.60	8.64	2.48
.80	12.16	4.13
1.00	16.00	6.16

12' x 1' CHANNEL
SIDE SLOPE= .25 '/'
n= .033
LENGTH= 20 FT
SLOPE= .0001 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .52 FT
PEAK VELOCITY= .3 FPS
TRAVEL TIME = 1.2 MIN
SPAN= 10-20 HRS, dt=.08 HRS

REACH 6 INFLOW & OUTFLOW
Riprap Apron



Data for Bare KBRP/RP C-CLC-K-00284
TYPE II 24-HOUR RAINFALL= 5.90 IN

16 Oct 00

Prepared by
HydroCAD 5.11 001374 (c) 1986-1999 Applied Microcomputer Systems

SUBCATCHMENT 6 **Area 6**

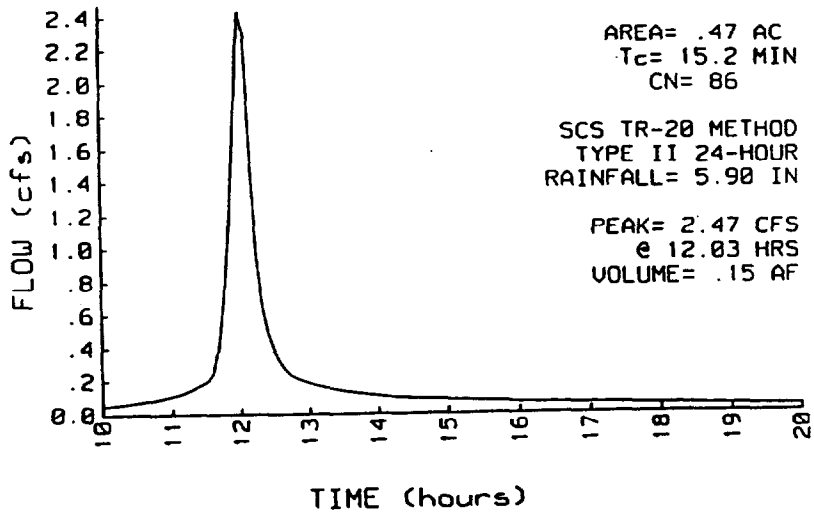
PEAK= 2.47 CFS @ 12.03 HRS, VOLUME= .15 AF

ACRES	CN	
.47	86	Bare Soil

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 5.90 IN
SPAN= 10-20 HRS, dt=.08 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:**	15.2
Cultivated: Residue>20%	n=.17 L=262' P2=3.9 in s=.046 '/'	

SUBCATCHMENT 6 RUNOFF
Area 6



REACH 3 North Channel - Grass - Segment 3

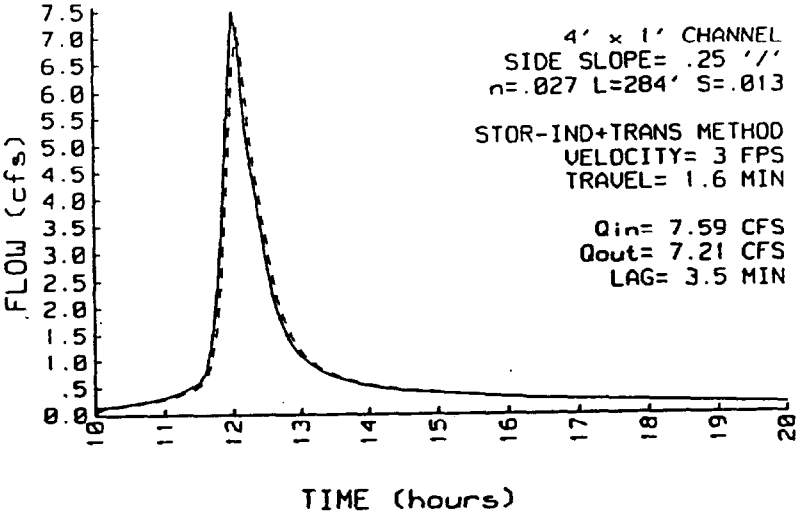
Qin = 7.59 CFS @ 12.02 HRS, VOLUME= .64 AF
Qout= 7.21 CFS @ 12.08 HRS, VOLUME= .63 AF, ATTEN= 5%, LAG= 3.5 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.00	0.00	0.00
.10	.44	.56
.20	.96	1.85
.30	1.56	3.79
.43	2.46	7.31
.60	3.84	13.71
.80	5.76	24.07
1.00	8.00	37.80

4' x 1' CHANNEL
SIDE SLOPE= .25 '/'
n= .027
LENGTH= 284 FT
SLOPE= .013 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .43 FT
PEAK VELOCITY= 3.0 FPS
TRAVEL TIME = 1.6 MIN
SPAN= 10-20 HRS, dt=.08 HRS

REACH 3 INFLOW & OUTFLOW
North Channel - Grass - Segment 3



REACH 6 **Riprap Apron**

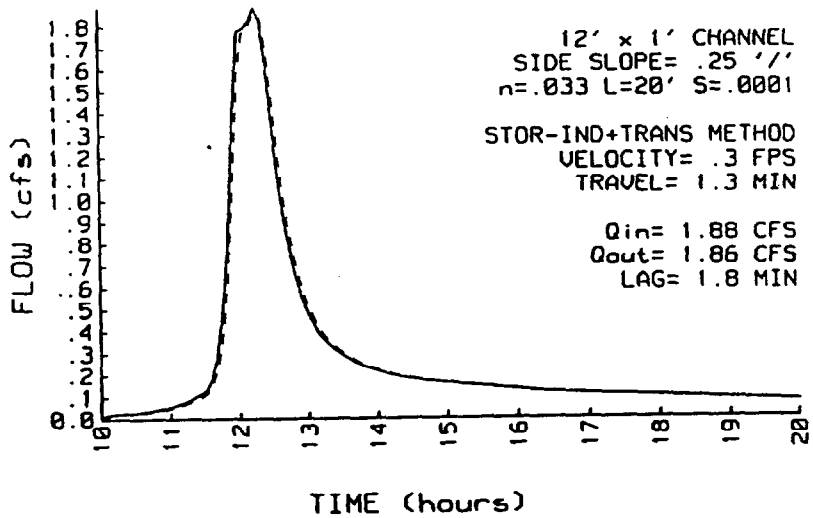
Qin = 1.88 CFS @ 12.24 HRS, VOLUME= .22 AF
Qout= 1.86 CFS @ 12.27 HRS, VOLUME= .22 AF, ATTEN= 1%, LAG= 1.8 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.00	0.00	0.00
.10	1.24	.12
.20	2.56	.38
.30	3.96	.75
.43	5.90	1.39
.60	8.64	2.48
.80	12.16	4.13
1.00	16.00	6.16

12' x 1' CHANNEL
SIDE SLOPE= .25 '/'
n= .033
LENGTH= 20 FT
SLOPE= .0001 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .51 FT
PEAK VELOCITY= .3 FPS
TRAVEL TIME = 1.3 MIN
SPAN= 10-20 HRS, dt=.08 HRS

REACH 6 INFLOW & OUTFLOW
Riprap Apron



SUBCATCHMENT 6 **Area 6**

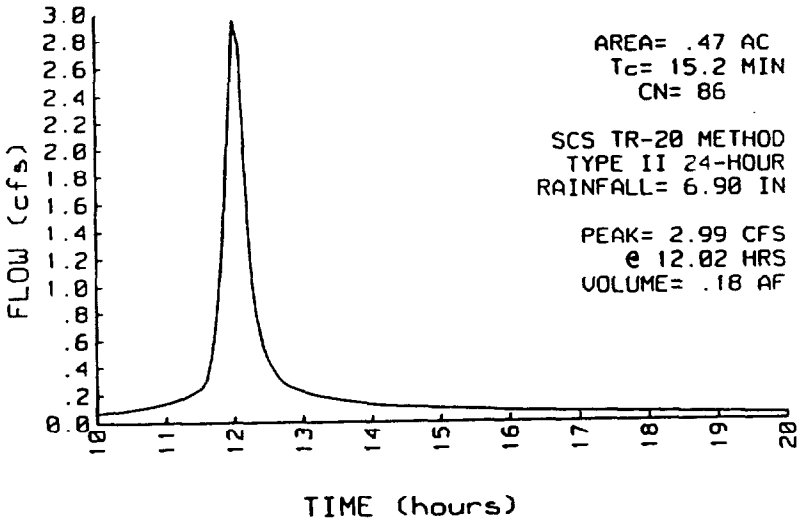
PEAK= 2.99 CFS @ 12.02 HRS, VOLUME= .18 AF

ACRES	CN	
.47	86	Bare Soil

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 6.90 IN
SPAN= 10-20 HRS, dt=.08 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**Segment ID:**	15.2
Cultivated: Residue>20%	n=.17 L=262' P2=3.9 in s=.046 '/'	

SUBCATCHMENT 6 RUNOFF
Area 6



REACH 3 **North Channel - Grass - Segment 3**

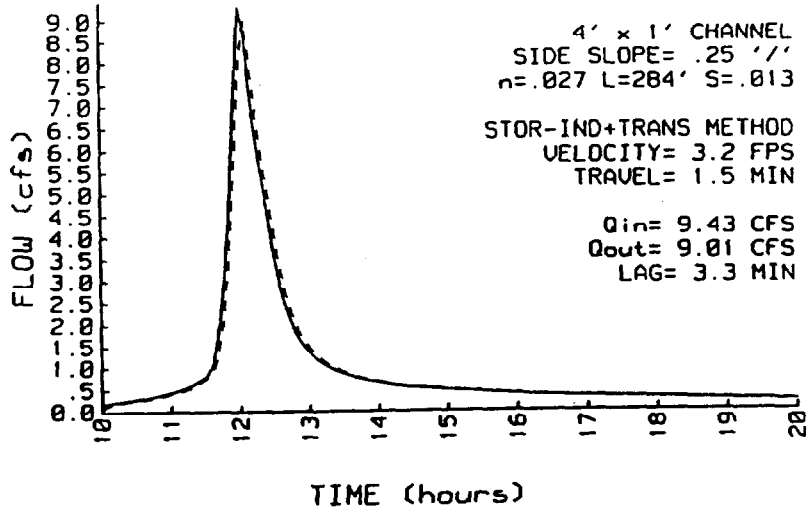
Qin = 9.43 CFS @ 12.02 HRS, VOLUME= .80 AF
Qout= 9.01 CFS @ 12.08 HRS, VOLUME= .80 AF, ATTEN= 4%, LAG= 3.3 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.00	0.00	0.00
.10	.44	.56
.20	.96	1.85
.30	1.56	3.79
.43	2.46	7.31
.60	3.84	13.71
.80	5.76	24.07
1.00	8.00	37.80

4' x 1' CHANNEL
SIDE SLOPE= .25 '/'
n= .027
LENGTH= 284 FT
SLOPE= .013 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .48 FT
PEAK VELOCITY= 3.2 FPS
TRAVEL TIME = 1.5 MIN
SPAN= 10-20 HRS, dt=.08 HRS

REACH 3 INFLOW & OUTFLOW
North Channel - Grass - Segment 3



REACH 6 **Riprap Apron**

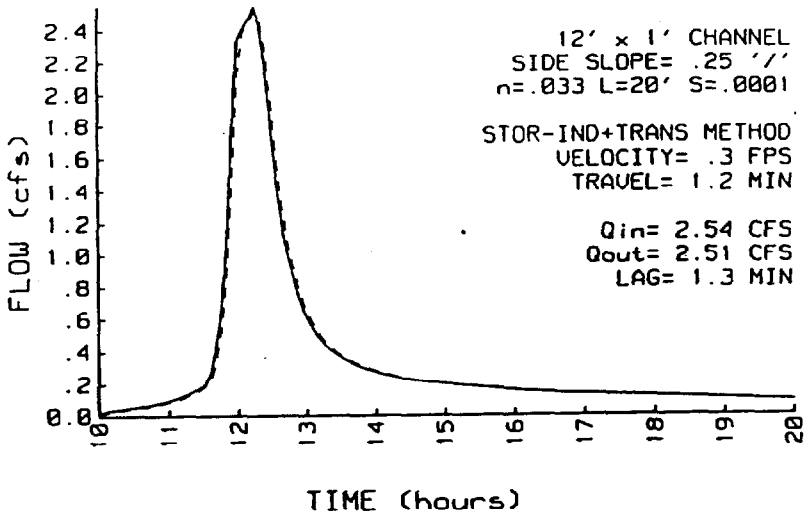
Qin = 2.54 CFS @ 12.23 HRS, VOLUME= .29 AF
Qout= 2.51 CFS @ 12.26 HRS, VOLUME= .29 AF, ATTEN= 1%, LAG= 1.3 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.00	0.00	0.00
.10	1.24	.12
.20	2.56	.38
.30	3.96	.75
.43	5.90	1.39
.60	8.64	2.48
.80	12.16	4.13
1.00	16.00	6.16

12' x 1' CHANNEL
SIDE SLOPE= .25 '/'
n= .033
LENGTH= 20 FT
SLOPE= .0001 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .61 FT
PEAK VELOCITY= .3 FPS
TRAVEL TIME = 1.2 MIN
SPAN= 10-20 HRS, dt=.08 HRS

REACH 6 INFLOW & OUTFLOW
Riprap Apron



APPENDIX E

SITE-SPECIFIC HEALTH AND SAFETY PLAN FOR K-AREA BURNING/RUBBLE PIT AND RUBBLE PILE REMEDIATION

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007820

SITE SPECIFIC HEALTH AND SAFETY PLAN

FOR

K-Area Burning/Rubble Pit and Rubble Pile Remediation (U)

Q-SHP-K-00004
REVISION 1
January 30, 2001

PROJECT NO.: 508/1219

Prepared by:
Pat Nakagawa, ERD
Bill Brummer, ERD

IF THE PROJECT DESCRIBED IN THIS SSHASP HAS NOT COMMENCED OR IS IN THE REMEDIATION PROCESS, THIS SSHASP MUST BE REVIEWED ON A 12 MONTH CYCLE, BY THE ERD SAFETY & HEALTH LEAD, FOR APPLICABILITY WITH THE CURRENT PROJECT SCOPE OF WORK, AND APPLICABLE HEALTH & SAFETY PROCEDURAL UPDATES.

SRS APPROVALS

Emory H. Jones SRS Occupational Safety	Signature	1/25/01 Date
KERRY H. CAYTON SRS Industrial Hygiene	Signature	1/30/01 Date
W.A. Brummer for Harold Gayne SRS Emergency Services	Signature	Per e-mail 1/22/01 Date

☒ This SSHASP documents the safety basis for this project and is approved.
☐ This SSHASP does not document the safety basis for this project.

1/30/01 / AMIT GANGULY ERD Project Technical Lead	Signature	1/30/01 Date
LARRY ANDERSON ERD Project Construction Lead or PIC	Signature	1/29/01 Date
Joe Price ERD Project Environmental Coordinator	Signature	1/29/01 Date
ROBERT T TARRANT ERD Cognizant Quality Function	Signature	1/29/01 Date
T. R. BLAND ERD Project Task Team Lead	Signature	1/29/01 Date
Michael Shotton ERD Project Manager	Signature	1-30-01 Date
 ERD Project Safety & Health Lead	Signature	1/30/01 Date

Post this table at the work site

Table 1 Emergency Notification Instructions for K-BRP/RP

Persons to Notify	Name	Numbers		
		Office	Pager	Home
Fire, Rescue, Security, Medical, Spill	SUD Dispatcher	• KIJ5 (ERD radio) or 725-2639		
or	Savannah River Site Operations Center (SRSOC)	• 725-1911 • 3-3911 (SRS phone) • CB Channel 9		
SIRIM Reporting Official (SRO)	Bill Brummer	952-7490	#18357	(803) 278-5303
ERD Project Manager (ERD-PM) ERD Deputy Project Manager (ERD-DPM)	Bruce Schappell Mike Shotton	952-6541 952-6437	#12754 #13052	N/A N/A
ERD Task Team Lead	Terry Bland	952-6387	#17911	N/A
Subcontract Technical Representative (STR)	Larry Anderson	952-6700	#14471	N/A
Person in Charge (PIC)	Larry Anderson	952-6700	#14471	N/A
Subcontractor Project Manager (PM)				N/A
Subcontractor Field Manager (FM)				N/A
Health and Safety Officer (HSO)				N/A
SRS Occupational Safety	Emory Jones	952-8370	#12571	N/A
SRS Industrial Hygiene	Kerry Layton B. Brumbaugh	557-5352 557-5657	#14577 #13398	N/A N/A
SRS Radiological Control Operations (RCO)	N/A	N/A	N/A	N/A
Environmental Coordinator	Joe Price	952-6708	#17718	N/A
SIRIM Coordinator	Terry Godsey	952-7199	#16752	(803) 642-5075
IDW Coordinator	Dennis Murphy	952-6721	#19008	N/A
SRS Weather Info.	ShRINE	1. "Weather" 2. "Current Conditions at SRS" 3. "Current Conditions (incl. Heat Stress info.)"		

The Field Team is contacted in the field by:	Pager:	Cell Telephone:

For all pager numbers prefixed by # dial 725-PAGE (7243) and then enter the five digit pager and then a number for the person contacted to call.

Primary Rally Point:	HSO's vehicle at the work site (or as designated by the HSO)
Alternate Rally Point:	Outside Bldg. **704-K**, North Side
Nearest Shelter:	Bldg. **151-1K** or 105-K or 151-2K
Nearest Medical Assistance:	Bldg. 719-5N (Mon-Fri); Bldg 719-H (24hrs)

Give the dispatcher the following directions to the work site:

We are at Grid Location S3W2. We are at 131-K. This is the "K-Area Burning/Rubble Pit". It is outside the K-Area fence and east of trailer 704-56K. It is close to Road 6-4.22 which goes between K & L Areas. A person will meet the emergency vehicle on Road 6-4.22.

TABLE OF CONTENTS

INTRODUCTION

This Site-Specific Health and Safety Plan (SSHASP) describes the safety, health, and emergency action requirements for remediation at the K-Area Burning/Rubble Pit and Rubble Pile (K-BRP/RP). The goal of this activity is to install a soil cover and monitoring wells. This activity is described in WSRC-RP-97-862, Rev. 0, *Record of Decision Remedial Alternative Selection for the K-Area Burning/Rubble Pit (131K) and Rubble Pile (631-20G) Operable Unit (U).*

This waste site consists of two individual sites adjacent to each other. The identifiers for these sites are:

Official Identifier	Acronym
K-Area Burning/Rubble Pit, 131-K	K-BRP
K-Area Rubble Pile, 631-20G	K-RP

Standard requirements applicable to this SSHASP are described in WSRC-RP-98-4070, *Standard Health and Safety Plan Requirements*, which is attached to this SSHASP as Attachment 1. Requirements that amplify or modify the standard requirements of Attachment 1 are detailed in this site-specific portion of this SSHASP. Section numbers and titles herein correlate to the section numbers and titles in Attachment 1.

1.0 SITE HISTORY AND DESCRIPTION

1.1 PERTINENT SITE INFORMATION

1.1.1 Location

The K-BRP/RP is located east of the K-Area Reactor.

1.1.2 Facility Description

The K-BRP/RP was used for bulk solid waste disposal during operation of the K-Area facilities. The K-BRP received combustible materials which were burned in the pit.

1.1.3 Timeframe of Facility Operations

The K-BRP/RP was used from the time of SRS construction. The K-BRP was closed in 1983. The K-RP was reportedly closed in the 1970's.

1.1.4 Current Disposition

The site is now maintained as a Resource Conservation and Recovery Act (RCRA) solid waste management unit and Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) waste site.

1.1.5 Security System

This site is afforded the level of security provided by being inside the SRS boundaries. There is no fence, however the boundaries of the individual sites are marked with orange balls at their corners.

1.1.6 Radiological Areas

The area is not a radiological area.

1.1.7 Other Hazardous Conditions

Other potential hazards include noise associated with the operation of machinery; severe weather; heat stress; cold stress; and poisonous, toxic, or harmful plants, animals, and insects. Also, asbestos containing materials may be present.

1.2 SUMMARY OF HAZARDOUS SUBSTANCES

There are no radiological hazards at this site. While there are hazardous chemicals, they are not in concentrations which normally pose a concern of occupational exposure to workers on this project.

1.3 DESCRIPTION OF TASKS

This SSHASP applies to workers when performing the following tasks.

- Modify or abandon existing monitoring wells
- Remove trees and brush.
- Consolidate contaminated soil
- Place the first lift of soil cover
- Perform confirmatory sampling
- Install groundwater monitoring wells using drill rig.

When the results of the 5th task, "Perform confirmatory sampling" demonstrate that the contamination is less than the remedial goal, there is no longer a potential hazardous waste exposure to the workers involved with installing the soil cover, thus, this SSHASP is not applicable for the following tasks:

- Complete installation of the soil cover system, including vegetative layer.
- Install signs, etc., for institutional control.

2.0 WORK SITE ORGANIZATION AND RESPONSIBILITIES

The requirements of Attachment 1, Section 2.0 shall be followed.

3.0 HAZARD OR RISK ANALYSIS

3.1 HAZARDOUS SUBSTANCE LEVELS

Construction hazards or risks analyses associated with each task identified in Section 1.3 are listed in Attachment 2, *Activity Hazard Analysis for K-Area Burning/Rubble Pit and Rubble Pile Remediation.* The hazard analysis related to the hazardous substances in the K-BRP/RP is described below.

The hazards discussed below are determined from data collected during the preliminary and Phase II Characterization efforts. Types and levels of contaminants are published in WSRC-RP-97-442, Rev. 1.2, *RFI/RI/BRA Report for the K-Area Burning/Rubble Pit (131K) and Rubble Pile (631-20G) (U).*

3.1.1 Radiological Materials

There are no radiological hazards in the soil or groundwater.

3.1.2 Hazardous Chemicals

K-BRP Soil. The chemical contaminants in the K-BRP soil which exceed applicable environmental thresholds are:

Contaminant	Max Level found (mg/Kg)
Benzo (a) anthracene	126.0

Contaminant	Max Level found (mg/Kg)
Benzo (a) pyrene	127.0
Benzo (b) flouranthene	171.0
Benzo (k) flouranthene	84.1
Dibenzo(a,h)anthracene	16.8
Indeno (1,2,3-cd) pyrene	73.7

K-RP Soil. The chemical contaminants in the K-RP soil which exceed applicable environmental thresholds are:

Contaminant	Max Level found (mg/Kg)
Benzo (a) anthracene	63.8
Benzo (a) pyrene	49.9
Benzo (b) flouranthene	80.6
Indeno (1,2,3-c,d) pyrene	30.1
Arsenic	120.0

Groundwater. The chemical contaminants in the groundwater which exceed applicable environmental thresholds are compared in the following table with the threshold limit value (TLV) published by the American Conference of Governmental Industrial Hygienists (ACGIH):

Contaminate	Max. Concentration	TLV
Tetrachloroethylene (PCE)	9.86 µg/L of water	25 ppm of air
Trichloroethylene (TCE)	3.32 µg/L of water	50 ppm of air

3.1.3 Hazardous Waste Storage

None

3.1.4 Other Hazards

Asbestos containing materials may be present, especially in the rubble pile.

3.2 EXPOSURE ROUTES

For the tasks identified in Section 1.3, the possible routes of personnel contamination are

- inhalation of contaminated dust particles.
- absorption of contaminated soil or groundwater through skin contact.
- ingestion of contaminated soil or groundwater.

3.3 HAZARD SUMMARY

3.3.1 Hazards Due to Hazardous Substances

Radioactivity

None

Chemicals

The levels of chemicals in the soils shown in Section 3.1.2 indicates:

- *Inhalation of dust*: Exposure to dust containing contaminated soil particles may pose a slight health hazard to workers.

- *Ingestion*: Only if a very large quantity of soil were ingested over a long period of time could there be a health hazard to workers.
- *Skin contact*: Only if there were an extremely prolonged skin contact with soil could there be a health hazard to workers.

The levels of chemicals in the groundwater shown in Section 3.1.2 indicates:

- *Inhalation*: Exposure to the groundwater is not significant relative to airborne occupational exposure levels at or above permissible exposure levels (PELs) or threshold limit values (TLVs) published by the American Conference of Governmental Industrial Hygienists (ACGIH).
- *Ingestion*: Large quantities of groundwater ingested over a long period of time may pose a health hazard to workers.
- *Skin contact*: Repeated and prolonged dermal contact may increase the risk of a health hazard.

Hazardous Waste Storage

None.

4.0 HEALTH AND SAFETY TRAINING

The requirements of Attachment 1, Section 4.0 shall be followed with the following additions:

4.1.2 General Site Workers

This section of Attachment 1 is not applicable because the activity described in Section 1.3 does not require general site workers as defined by 29 CFR 1910.120 (e)(3)(i).

4.2.1 Initial Briefing for Workers

The initial briefing for workers shall include recognition of suspect asbestos containing material.

5.0 ENGINEERING CONTROLS AND PERSONAL PROTECTIVE EQUIPMENT

The requirements of Attachment 1, Section 5.0 shall be followed with the following additions:

5.2 WORK PRACTICE CONTROLS

To address the risk from contaminated dust, workers shall assure that the soil being disturbed is damp. If the soil is not damp from natural causes, water shall be sprinkled on the area to prevent dust in the breathing zone of the workers.

If materials are found that are suspected of containing asbestos, these materials shall be immediately reported to the HSO and shall be avoided until a specific plan is documented and approved describing the safe disposition of these materials.

5.3 PERSONAL PROTECTIVE EQUIPMENT (PPE) CONTROLS

Latex gloves and safety glasses are required to prevent absorption and ingestion of hazardous substances when handling soils.

For groundwater activities, the HSO shall specify the following additional PPE when performing the specific activities shown:

Activity	PPE
drilling & well installation	puncture resistance gloves

Activity	PPE
high noise level operations	hearing protection
well development	latex gloves

6.0 MEDICAL SURVEILLANCE

The requirements of Attachment 1, Section 6.0 shall be followed.

7.0 MONITORING

The requirements of Attachment 1, Section 7.0 shall be followed with the following exceptions:

7.1 CHEMICAL AIR MONITORING

No hazardous substance monitoring is required when dust is controlled as described in Section 5.1.

Otherwise, although no inhalation risk is anticipated, as a precaution, the HSO shall ensure that air monitoring for VOCs is performed in the breathing zone (i.e., the area forward of the shoulders and within 9 inches of the nose and mouth) of at least one worker performing activities associated with the soil.

Action threshold: If chemical air monitoring reveals that concentrations of VOCs are above 25 ppm, then the HSO shall direct action to prevent a concentration of VOCs above this threshold in a worker's breathing zone.

NOTE: The action threshold of 25 ppm is based on the time-weighted average (TWA) of the threshold limit value (TLV) for tetrachloroethylene (PCE) which is the lowest TLV for all VOCs.

8.0 SITE CONTROLS

The requirements of Attachment 1, Section 8.0 shall be followed with the following exceptions:

8.1 WORK ZONES

8.1.2 Contamination Reduction Zone

A CRZ is not required.

8.2.1 Site Map

The location of the K-BRP/RP is described in text form on Table 1.

9.0 DECONTAMINATION

The requirements of Attachment 1, Section 9.0 shall be followed.

10.0 EMERGENCY ACTION PLAN

The requirements of Attachment 1, Section 10.0 shall be followed.

11.0 EXCAVATION AND CONFINED SPACE ENTRY

The requirements of Attachment 1, Section 11.0 shall be followed.

12.0 SPILL CONTAINMENT

The requirements of Attachment 1, Section 12.0 shall be followed. Potential spill situations include:

Potential Spill Situation	Control
Equipment hydraulic line rupture	Spill kit for fluids
Gas or diesel fuel spill during refueling	Spill kit for fluids

13.0 EQUIPMENT

The requirements of Attachment 1, Section 13.0 shall be followed.

14.0 RECORD KEEPING

The requirements of Attachment 1, Section 14.0 shall be followed.

REFERENCES

Attachment 1, WSRC-RP-98-4070, Rev. 8	Standard Health and Safety Plan Requirements (U)
Attachment 2	Activity Hazard Analysis for K-Area Burning/Rubble Pit and Rubble Pile Remediation
WSRC-RP-97-862, Rev. 1	Record of Decision Remedial Alternative Selection for the K-Area Burning/Rubble Pit (131K) and Rubble Pile (631-20G) Operable Unit (U).
WSRC-RP-97-442, Rev. 1.1	RFI/RI/BRA Report for the K-area Burning/Rubble Pit (131-K) and Rubble Pile (631-20G)

SRS APPROVALS

Emory H. Jones **SRS Occupational Safety**	E H Jones Signature	1/25/01 Date
KERRY H. CAYTON **SRS Industrial Hygiene**	Kerry H. Cayton Signature	1/30/01 Date
W.A. Brummer for Harold Sayre **SRS Emergency Services**	W.A. Brummer Per e-mail Signature	1/22/01 Date

☒ This SSHASP documents the safety basis for this project and is approved.
☐ This SSHASP does not document the safety basis for this project.

1/30/01 / AMIT GANGULY **ERD Project Technical Lead**	A Ganguly Signature	1/30/01 Date
LARRY ANDERSON **ERD Project Construction Lead or PIC**	Larry Anderson Signature	1/29/01 Date
Joe Price **ERD Project Environmental Coordinator**	J K Price Signature	1/29/01 Date
ROBERT T TARRANT **ERD Cognizant Quality Function**	Robert T Tarrant Signature	1/29/01 Date
T. R. BLAND **ERD Project Task Team Lead**	T R Bland Signature	1/29/01 Date
Michael Shotton **ERD Project Manager**	Michael Shotton Signature	1-30-01 Date
M A Brummer **ERD Project Safety & Health Lead**	M A Brummer Signature	1/30/01 Date

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ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
CAT	Consolidated Annual Training
CFR	Code of Federal Regulations
CPR	cardio-pulmonary resuscitation
CRZ	contamination reduction zone
CSWE	Central Service Works Engineering
db(A)	decibels on the A scale
DPM	Deputy Project Manager
DPT	direct push technology
DOE	United States Department of Energy
EMS	emergency medical service
ERD	Environmental Restoration Division of WSRC
ESH&QA	Environment, Safety, Health, and Quality Assurance Division of WSRC
EZ	exclusion zone
FM	Field Manager
GET	General Employee Training
H&S	health and safety
HAZMAT	hazardous materials
HAZWOPER	hazardous waste operations and emergency response
HSO	Health and Safety Officer
IH	industrial hygienist
NSC	National Safety Council
OVA	organic vapor analyzer
PEL	permissible exposure level
PIC	Person in Charge
PID	photo-ionization detector
PM	Project Manager
PPE	personal protective equipment
PTTL	Project Task Team Lead
RadCon	Radiological Control
RWT	Radiological Worker Training
RWP	Radiological Work Permit
SIRIM	site item reportability and issues management
STR/TOR	Subcontract Technical Representative or Task Order Representative
SRO	SIRIM Reporting Official
SRS	Savannah River Site
SRSOC	SRS Operations Center
SSHASP	site-specific health and safety plan
SZ	support zone
TLV	threshold limit value
WBGT	wet bulb globe temperature
WCP	Work Clearance Permit
WSRC	Westinghouse Savannah River Company

Attachment 1

WSRC-RP-98-4070
Revision 8

STANDARD HEALTH AND SAFETY PLAN REQUIREMENTS (U)

This Document is Approved for Use as an Attachment to a Site-Specific Health and Safety Plan

ERD Safety & Health Manager

L. K. Theobo		1/28/00
Printed Name	Signature	Date

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Environmental Restoration Division
Standard Health and Safety Plan Requirements

INTRODUCTION

A Site-Specific Health and Safety Plan (SSHASP) describes the safety, health, and emergency action requirements for certain activities associated with hazardous waste activities at specific waste sites located on the Savannah River Site (SRS) which is managed by Westinghouse Savannah River Company (WSRC) for the United States Department of Energy (DOE). When required by 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response*, activities at waste sites managed by the Environmental Restoration Division (ERD) are controlled with a SSHASP.

This document addresses the standard requirements applicable to SSHASPs for projects managed by ERD. These requirements address work site hazards and risks, personnel responsibilities, environmental monitoring, personal protective equipment (PPE), and required health and safety (H&S) procedures.

This document is to be attached to a SSHASP and includes information normally applicable to any ERD waste site. Information applicable to the specific waste site is included in the site-specific portion of the SSHASP. Any modification to these requirements is specifically described in the site-specific portion of the SSHASP and takes precedence over the applicable requirements herein.

In addition to the requirements identified in the SSHASP, other requirements related to health and safety are found in documents listed in the References section as well as applicable subcontractor's documents. Copies of these documents shall be made available to workers and visitors upon request.

1.0 SITE HISTORY AND DESCRIPTION

1.1 PERTINENT SITE INFORMATION

Section 1.1 of the site-specific portion of the SSHASP describes the pertinent site information.

1.2 SUMMARY OF HAZARDOUS SUBSTANCES

Section 1.2 of the site-specific portion of the SSHASP summarizes the hazardous substances.

1.3 DESCRIPTION OF TASKS

Section 1.3 of the site-specific portion of the SSHASP describes the work tasks to be accomplished.

2.0 WORK SITE ORGANIZATION AND RESPONSIBILITIES

2.1 DEFINITIONS

References to personnel are to be understood as follows:

2.1.1 Workers

A worker is any person (e.g., operator, laborer, and supervisor) at the work site who is either:

- A general site worker as defined by 29 CFR 1910.120 (e)(3)(i).
- A limited task worker as defined by 29 CFR 1910.120 (e)(3)(ii).
- A worker in a no health hazard area as explained in 29 CFR 1910.120 (e)(3)(iii).

2.1.2 Visitors

A visitor is a person who enters the work zone but does not perform work according to the Work Clearance Permit (WCP) and who maintains a very low risk of exposure to hazardous substances. Specifically, the following personnel should be normally recognized as visitors:

- Personnel performing limited duties such as surveillance, assessment, or observation
- Delivery personnel entering the work zone solely for the purpose of delivering supplies or equipment and remaining only for the duration of the delivery task
- Professional emergency responders (e.g., fire, ambulance, spill team)

2.1.3 Observers

An observer is any person who is in the general vicinity but remains outside the work zone. (As described in Section 8.1, observers are not subject to the terms of the SSHASP.)

2.2 CHAIN OF COMMAND

The chain of command for H&S issues is depicted in Figure 2-1.

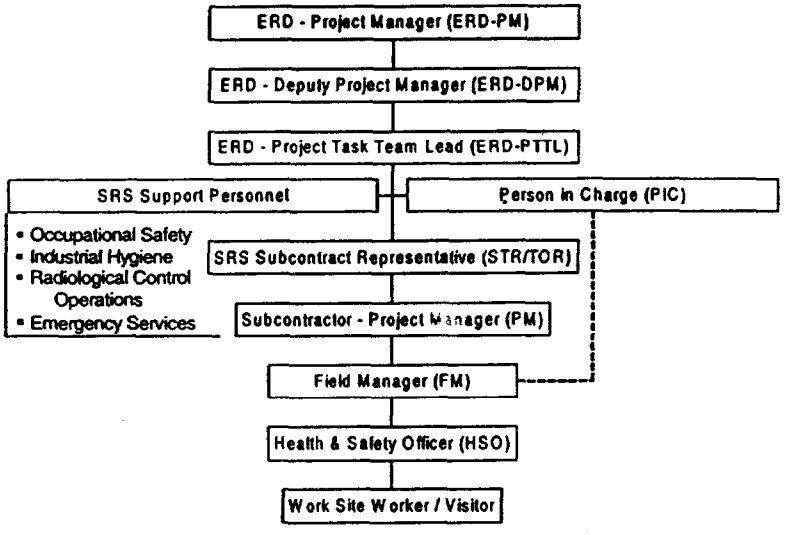

Figure 2-1 Chain of Command

WSRC is the prime management and operating contractor for SRS with ultimate authority and primary responsibility for work site operations that include work site health and safety. The WSRC Environmental Restoration Division Project Manager (ERD-PM) is responsible for overall project management. Authority to execute this responsibility is delegated through the Deputy Project Manager (ERD-DPM) to the ERD Project Task Team Lead (ERD-PTTL). The ERD-PTTL guides the SRS Subcontract Technical Representative (STR) or Task Order Representative (TOR), whichever function is applicable for the specific project. The STR/TOR officially provides technical direction to the subcontractors. Within the subcontractor's organization, the subcontractor Project Manager (PM) directs the subcontractor Field Manager (FM), who, in turn, provides direction in the field for task execution. The Person in Charge (PIC) assures task execution in the field complies with work scope directed by the ERD-PTTL.

An individual shall be assigned to perform the duties of Health & Safety Officer (HSO) as required by 29 CFR 1910.120. Normally, this individual shall be the HSO identified in Table 1, "Emergency Notification Instructions" in the site-specific portion of the SSHASP. However, these duties may be delegated to any qualified individual. When HSO duties are delegated, workers and visitors shall be informed which person is currently performing the HSO duties.

The HSO shall be stationed in the immediate area of hazardous waste activities, that is, any activity involving the possibility of human contact with hazardous substances, as described in Section 3.0.

2.3 RESPONSIBILITIES OF WORKERS AND SUPERVISORS

Responsibilities of workers and their supervisors are shown in Table 2-1.

Table 2-1 Responsibilities

TITLE	GENERAL DESCRIPTION	SPECIFIC RESPONSIBILITIES
ERD Project Manager (ERD-PM) and Deputy Project Manager (DPM)	Responsible for defining project objectives, allocating resources, determining the chain of command, and evaluating program outcome.	• Provides the necessary facilities, equipment, and funding. • Provides adequate personnel and schedule resources to conduct activities safely.
ERD Project Task Team Lead (ERD-PTTL)	Reports to the ERD-PM/DPM. Assumes total control over work site activities.	• Has overall responsibility for directing activities supporting the tasks described in Section 1.3. • Prepares and organizes the plans for field activities, the work schedule, and the field team. • Obtains permission for work site access and coordinates activities with appropriate officials. • Prepares work packages and work permits. • Serves as the liaison with Facility Custodians. • Ensures that the SSHASP is documented and issued according to appropriate procedures. • Oversees implementation of H&S requirements. • Ensures that a site item reportability and issues management (SIRIM) Reporting Official (SRO) is identified.
Subcontract Technical or Task Order Representative (STR/TOR)	Represents the SRS procurement official (buyer) in technical matters associated with subcontract performance.	• Provides technical direction to the subcontractor as directed by the ERD-PTTL.
SRS Occupational Safety	Representative of the occupational safety function of the SRS Environment, Safety, Health, and Quality Assurance Division (ESH&QA).	• Provides professional guidance relative to occupational safety hazards and controls. • Reviews the Work Clearance Permit (WCP) for appropriate occupational safety controls.
SRS Industrial Hygienist (IH)	Representative of the industrial hygiene function of ESH&QA.	• Provides professional guidance relative to health hazard assessments of chemical, noise, and physical stress. • Reviews the WCP for Personal Protective Equipment (PPE) and hazard monitoring requirements for potential exposures. • Provides professional guidance in the performance of IH specified monitoring required on the WCP.
SRS Radiological Control Operations (RCO)	Representative of the radiological control function of ESH&QA.	• Provides professional guidance relative to radiological assessments. • Performs oversight of RadCon
Radiological Control (RadCon)	Expert in the definition and application of radiological controls.	• Assures implementation of radiological controls at the work site. • Approves the Radiological Work Permit (RWP) to include the specification of PPE and radiological monitoring.
SRS Medical Support	Medical personnel at SRS medical facilities.	• Provides emergency treatment and decontamination procedures for the specific types of exposures that may occur at the work site. • Obtains special drugs, equipment, or supplies necessary to treat such exposures.

Table 2-1 Responsibilities

TITLE	GENERAL DESCRIPTION	SPECIFIC RESPONSIBILITIES
Site Emergency Services	Emergency Medical Service (EMS) Fire Department Rescue Team, HAZMAT Response Team.	• Establishes command of incident scene, provides fire fighting, HAZMAT cleanup, and rescue services • Identifies appropriate response to hazardous substances • Provides emergency medical treatment and transportation from the work site to medical facilities, as described by subcontract. • Maintains Memorandum of Understanding with hospitals. • Performs extractions and recovery of personnel (i.e., confined space extractions, etc.).
Person in Charge (PIC)	Provides a work site focal point for scope compliance, oversight, and surveillance of field work performance	• Oversees implementation of SSHASP requirements at the work site. • Coordinates with the FM and HSO (through the STR/TOR, if applicable) on matters related to work control, hazard analysis, and hazard control implementation. • Oversees control of access to the work site. • Oversees work site hazard communication, site-specific briefings, and field training to all workers and visitors. • Coordinates with the FM and HSO (through the STR/TOR, if applicable) to verify that project planning has been adequate for safe conduct of work. • Checks that the FM and HSO have verified workers meet all required qualifications.
Subcontractor Project Manager and subtier subcontractor Project Managers	Responsible for managing implementation of tasks as scoped by the subcontract statement of work.	• Reports to the STR/TOR. • Ensures all subcontractor employees who are workers at the work site are medically fit for duty. • Ensures all subcontractor employees who are workers at the work site have the required training. • Ensures all subcontractor employees who are workers at the work site understand and accept the SSHASP prior to working at the work site.
Field Manager, (including the Field Manager for each subtier subcontractor)	Responsible for directing their company's employees who are workers at the work site. Acts as the health & safety representative for their company.	• Reports to the company project manager. • Is stationed at the work site. • Implements the work plan and maintains schedules. • Leads and conducts subcontractor activities at the work site • Ensures that safety equipment (including PPE) is available, maintained, and properly used by subcontract employees. • Coordinates with the HSO on matters related to work control, hazard analysis, and hazard control implementation. • Oversees their company's implementation of SSHASP requirements. • Controls access to the work site. • Ensures work site hazard communication, site-specific briefings, and field training are provided. • Works closely with the HSO to verify that project planning has been adequate and that work is conducted safely. • Jointly, with the HSO, verifies workers meet all required qualifications including training and medical surveillance. • Notifies the HSO and STR/TOR of any job-related illness or injury of their employees. • May assume the role of HSO if the HSO so delegates and if qualified per the requirements herein.

Table 2-1 Responsibilities

TITLE	GENERAL DESCRIPTION	SPECIFIC RESPONSIBILITIES
Health & Safety Officer (HSO)	Administers compliance of the SSHASP by all workers and visitors.	• Reports to the FM (through the STR/TOR, if applicable). • Is stationed at the work site in the immediate area of hazardous waste activities. • Concurs with the SSHASP and all SSHASP amendments. • Verifies effectiveness of SSHASP requirements • Enforces implementation of the SSHASP. • Verifies compliance with SSHASP requirements. • Reports H&S violations to the appropriate FM and the STR/TOR, if applicable. • Verifies that project planning focuses on H&S. • Participates in work control process and conducts hazard analyses. • Identifies work practices or conditions that may result in injury or exposure to hazards. • Recommends modifications of work plans or protection levels. • Specifies and supports implementation of hazard controls. • Jointly, with FM, verifies workers meet all required qualifications. • Ensures H&S training briefings are conducted. • Selects PPE, verifies effectiveness of PPE, and verifies that PPE is properly stored and maintained. • Enforces the use of PPE as determined by established personnel protection levels. • Arranges monitoring of exposures and stressors. • Controls access to the work zone. • Ensures that entry and exit of work site are monitored. • Verifies that the "buddy system" is properly implemented and used. • Monitors decontamination procedures. • Ensures that a method exists for notifying workers and visitors of emergencies. • Assists in the coordination of emergency response activities with emergency responder professionals. • Assures the availability of personnel qualified in first aid and cardio-pulmonary resuscitation (CPR) response, when required. • Advises professional emergency responders of hazards and exposure potentials. • Ensures that incidents are reported to the SIRIM Reporting Official (SRO) within 2 hours.

A list of individuals assigned to the above responsibilities (see Table 1 in the site-specific portion of the SSHASP) shall be posted on the work site. Each individual may designate a qualified person to assume responsibility in his or her absence.

2.4 IMPLEMENTATION OF THE SSHASP

The ERD-PTTL is responsible to develop, issue, and amend the SSHASP per WSRC-C-1, ER-AP-032, *Environmental Restoration Unit-Specific Health and Safety Plan Preparation*. The ERD-PTTL shall ensure that the provisions of the SSHASP are satisfied. The HSO shall ensure that all work site personnel comply with the SSHASP and that inspections are conducted as necessary to determine the effectiveness of the SSHASP. Such inspections shall be documented (e.g., in the HSO's logbook of daily activities).

All work shall conform to the requirements of the SSHASP until an amendment is formally authorized. Amendments that address hazards or hazard levels are made by revision. Amendments that do not affect the hazards to the workers or visitors may be made by field modification (see Appendix D).

3.0 HAZARD OR RISK ANALYSIS

3.1 HAZARDOUS SUBSTANCE LEVELS

Section 3.1 of the site-specific portion of the SSHASP describes the chemical and radiological hazards to which workers may be exposed. This provides the workers an understanding of the types and levels of hazardous substances that might be encountered while engaged in the tasks described in Section 1.3.

3.2 EXPOSURE ROUTES

Section 3.2 of the site-specific portion of the SSHASP describes the possible routes of personnel exposure to hazardous substances when workers are engaged in the tasks described in Section 1.3. These routes address inhalation, ingestion, and skin contact.

3.3 HAZARD SUMMARY

3.3.1 Hazards Due to Hazardous Substances

The site-specific portion of the SSHASP summarizes the most significant potential exposure to workers from

- radiological materials,
- hazardous chemicals, and
- hazardous waste storage at or near the waste site during removal or remedial actions to include a description of any hazards to human health or the environment from fires, explosions, or any unplanned release of this stored hazardous waste.

Typically, these include hazards relative to airborne occupational exposure levels at or above Permissible Exposure Limits (PELs) or Threshold Limit Values (TLVs) published by the American Conference of Governmental Industrial Hygienists (ACGIH).

3.3.2 Hazards Due to Noise

Noise is a potential hazard associated with the operation of machinery such as heavy equipment.

3.3.3 Hazards Due to Severe Weather

Thunderstorms are common during the spring, summer, and early fall. Lightning is a hazard, especially to workers who operate electrical equipment, heavy equipment with overhead metallic components, or a direct push technology (DPT) rig when the rod is in the ground.

Winter storms, consisting of high winds and frozen precipitation, are likely during the winter. Tornado conditions are likely during the spring and during the fall hurricane season.

Winds can cause potentially hazardous soil, sediment, and dust to become airborne. High winds can damage poorly secured equipment. High winds can also cause unsecured equipment to become missiles.

3.3.4 Hazards Due to Heat Stress and Cold Stress

Heat stress may occur when tasks are performed in temperatures greater than 70°F, or while wearing protective clothing (e.g., coveralls and respirators).

Cold stress may occur when work activities are performed in temperatures below 40°F, especially if clothing is damp or wet (e.g., from perspiration).

3.3.5 Hazards Due to Poisonous/Toxic/Dangerous Organisms

Plants (poison ivy, poison oak, etc.), animals (snakes, etc.), and insects (spiders, ticks, fire ants, wasps, etc.) with negative health impacts may be present at the work site. The potential for exposure to plants, animals, and insects is lower during the winter months than during other seasons.

4.0 HEALTH AND SAFETY TRAINING

This training facilitates conformance with prescribed safety practices, allows workers to clarify misunderstandings, and reinforces worker responsibilities regarding safe operations.

4.1 GENERAL TRAINING

While the worker is at the work site, documentation of the worker's training qualifications shall be maintained at the work site. The following are acceptable documentation methods:

a) The actual certification carried on the worker's person.
b) A copy of the training certification.
c) A certification on company letterhead and signed by a company official that the training qualification has been satisfied.

The HSO shall verify that each worker's applicable training qualifications are current prior to allowing the individual worker to begin applicable work activities. The Worker Qualification Matrix (Appendix D) may be used to aid in assuring that all applicable training qualifications have been verified before the worker begins work activities. When signed by the HSO, or designee, this matrix may also be recognized as validation that certifications carried on the worker's person were, in fact, verified as being current at the time the worker was at the work site.

4.1.1 Limited Task Workers and No Health Hazard Workers

Limited task workers and no health hazard workers shall meet the requirements of Table 4-1.

Table 4-1 Training Requirements for all Workers

REQUIREMENT	ACCEPTABLE DOCUMENTATION
• Trained to a level required by their job function and responsibility.	• Applicable certifications such as operator's license, CPR certificate, etc.
• SRS entry qualification, either General Employee Training (GET) or Consolidated Annual Training (CAT) or white badge requirements. (NOTE: White badges are for workers whose job functions at SRS last less than 10 days per WSRC 7Q Security Manual Procedure 504).	• The person's badge issued by SRS.
• 24-Hour HAZWOPER training per 29 CFR 1910.120(e)(3)(ii).	• Documentation issued by the agency that provided the training.
• One day of actual field experience per 29 CFR 1910.120(e)(3)(ii). The HSO may certify the experience on the job per WSRC 20Q, E, Remediation Safety and Health Training Requirement.	• A document issued by the person's employer (SRS employees use SRS form OSR 28-133 Hazardous Waste Supervised Field Experience).
• Annual refresher training for HAZWOPER training per 29 CFR 1910.120(e)(8), when applicable.	• Documentation issued by the agency that provided the training.
• SRS Radiological Worker II (RWT-II) training, if	• An SRS Radiological Qualifications card.

Table 4-1 Training Requirements for all Workers	
REQUIREMENT	ACCEPTABLE DOCUMENTATION
performing tasks governed by the Radiological Work Permit (RWP).	
• Harmful Plants and Animals training per 29 CFR 1926.21 (b) (4), Safety Training and Education. (e.g., WSRC Course Code QRIS1000)	• Documentation maintained by the person's employer or by the HSO.
• Awareness and Prevention of Heat Stress per WSRC 4Q, IH-502, Thermal Stress Management	• Documentation of WSRC Course Code QTIHAT05, or equivalent maintained by the person's employer or by the HSO.
• Site-specific pre-job briefings as described in Section 4.3, below.	• The person's signature on the appropriate Site Safety Meeting form (e.g. Appendix D).
• Instructions regarding PPE relevant to the worker's assigned task.	• None required
• Any other training or qualifications deemed necessary by the HSO.	• As specified by the HSO

4.1.2 General Site Workers

Both (a) general site workers and (b) limited task workers who wear respirators, shall meet all the requirements of Section 4.1.1, plus Table 4-2.

Table 4-2 Additional Training Requirements for General Site Workers	
REQUIREMENT	ACCEPTABLE DOCUMENTATION
• 40-Hour HAZWOPER training per 29 CFR 1910.120(e)(3)(ii).	• Document issued by the agency that provided the training.
• Three days of actual field experience per 29 CFR 1910.120(e)(3)(ii). The HSO may certify the experience on the job per WSRC 20Q, E.	• Document issued by the person's employer (e.g., SRS form OSR 28-133 Hazardous Waste Supervised Field Experience).
• If required to wear a respirator, training in negative pressure respirator, maintenance, and use of the equipment, fit test, and medical fitness certification.	• Respirator qualification certificate (e.g., OSR 4-358).

4.1.3 Supervisors

The HSO, as well as management and supervisory personnel at the work site who are directly responsible for, or who supervise employees engaged in hazardous waste operations, shall meet the requirements of Section 4.1.1. If they supervise General Site Workers, they shall also meet the requirements of Section 4.1.2. Additionally, they shall meet the requirements of Table 4-3.

Table 4-3 Additional Training Requirement for Supervisors	
REQUIREMENT	ACCEPTABLE DOCUMENTATION
• An additional 8 hours of management and supervisor training per 29 CFR 1910.120 (e)(4).	• Document issued by the agency that provided the training.

4.1.4 First Aid Providers

First aid providers shall be meet the requirements of Table 4-4.

Table 4-4 Training Requirement for First Aid Providers	
REQUIREMENT	ACCEPTABLE DOCUMENTATION
• First aid, cardio-pulmonary resuscitation (CPR), and bloodborne pathogens per the training requirements of the National Safety Council (NSC).	• Document issued by the agency that provided the training.

4.2 SITE-SPECIFIC BRIEFINGS

4.2.1 Initial Briefing for Workers

Each worker shall receive the initial briefing before beginning work. The initial briefing shall be documented on the Site Safety Meeting Form (Appendix D) or other suitable form. The initial briefing shall be conducted by the HSO, the ERD-PTTL, or a representative specifically designated by the HSO or ERD-PTTL. The initial briefing shall include the following:

a. Right-to-know
   - Identification of hazards
   - Risks associated with each hazard
   - Symptoms of exposure
   - Names of personnel assigned to the responsibilities identified in the table in Section 2.3
   - The fact that the SSHASP, the HSO's logbook, and the work permits are available at the work site for review

b. Scope of operations
   - Work site description and history
   - Project activities
   - Work site control and work zones
   - Work site access protocols

c. Monitoring for hazardous conditions
   - Radiological & chemical hazardous substances
   - Physical hazards

d. General safety responsibilities of workers and visitors
   - Personnel training
   - Safe work practices
   - Self monitoring
   - Stop work authority

e. Personal protection (specific for hazard levels and work areas)
   - Clothing and equipment for personal protection (PPE)
   - Biological monitoring requirements

f. Decontamination procedures
   - Types of contamination
   - Hazards related to decontamination
   - Procedures

g. Emergency preparedness
   - Location where emergency notification instructions are posted
   - Alarm techniques per Section 10.1
   - Location of rally points for assembly and accountability
   - Location of designated shelter
   - Location of emergency equipment
   - Evacuation routes – primary and alternate
   - Emergency entry and exit procedures for the work zone
   - Instructions for requesting emergency response professionals
   - Medical treatment at the work site, if appropriate
   - Process for reporting an incident

4.2.2 Initial Briefing for Visitors

Each visitor shall receive the initial briefing for visitors before entering the work zone. This briefing shall be documented on the Site Safety Meeting Form (Appendix D) or other suitable form. This initial briefing shall be conducted by the HSO, the ERD-PTTL, or a worker specifically designated by the HSO or ERD-PTTL. This initial briefing shall include the following:

- Vehicle parking restrictions established per Section 8.2.3

- The requirement to be escorted per Section 8.2.4
- Review hazards, per Section 3.0, relevant to the purpose of the visit
- Review of applicable emergency actions described in Section 10.0
- Review of procedures relevant to the purpose of the visit
- Instructions regarding PPE relevant to the purpose of the visit
- Other training or qualifications deemed necessary by the HSO due to the purpose of the visit

4.2.3 Additional Briefings

Workers and visitors shall receive additional safety briefings from the HSO or ERD-PTTL (or designee)

- When new operations are to be conducted
- When changes in work practices must be implemented because of newly available information
- When changes in work practices must be implemented because of a revision or field modification to the SSHASP
- When working conditions change
- When performance deficiencies are identified during routine daily activities
- When performance deficiencies are identified as a result of safety audits

These additional briefings shall be documented using the logbook or other suitable form.

5.0 ENGINEERING CONTROLS AND PERSONAL PROTECTIVE EQUIPMENT

5.1 ENGINEERING CONTROLS

Special engineering controls are described in Section 5.1 of the site-specific portion of the SSHASP, the WCP, or the RWP.

5.2 WORK PRACTICE CONTROLS

Special work practice (i.e., administrative) controls are described in Section 5.2 of the site-specific portion of the SSHASP, the WCP, or the RWP.

5.3 PERSONAL PROTECTIVE EQUIPMENT (PPE) CONTROLS

Special PPE requirements are described in Section 5.3 of the site-specific portion of the SSHASP, the WCP, or the RWP.

Unless specifically exempted by the HSO, all workers and visitors shall wear long pants, safety glasses with side shields, hard hats, and sturdy work shoes when inside the work zone described in Section 8.0. When handling soil or water that is potentially contaminated, workers should wear chemical resistant gloves. Additional PPE shall be used according to the work permits and other standard procedures applicable to the task.

PPE shall be inspected by the wearer before use.

The use of respiratory protection equipment shall comply with WSRC 4Q1.6, *Respiratory Protection Manual*. For each worker who wears respiratory protection, the following parameters shall be recorded in either the logbook or on a separate form:

- worker's name and other appropriate identification data,
- identification of the area containing the hazardous substances,
- date,

- time (in hours) under respiratory protection,
- maximum air monitoring levels, and
- type of respirator worn (in terms of Level C or B).

6.0 MEDICAL SURVEILLANCE

Medical surveillance is not applicable for non-covered employees.

A covered employee is a person who meets **any one** of the criteria specified in 29 CFR 1910.120 [f][2][i] through [iv]. These criteria are summarized as:

- exposed to hazardous substances or health hazards at or above the permissible exposure limits for 30 days or more a year
- wear a respirator for 30 days or more a year
- injured due to overexposure from an emergency incident involving hazardous substances or health hazards

All covered employees shall provide evidence of a medical fitness-for-duty examination consistent with 29 CFR 1910.120 (f) and signed by a physician. The HSO shall ensure that the covered employee's fitness-for-duty documentation is current prior to permitting the employee to engage in the activities described by the criteria above.

7.0 MONITORING

All monitoring equipment shall be calibrated and maintained per manufacturer's instructions and applicable regulations.

7.1 HAZARDOUS SUBSTANCE MONITORING

7.1.1 Air Monitoring

Section 7.1.1 of the site-specific portion of the SSHASP describes radiological or chemical air monitoring. This description includes or references

- the frequency and types of air monitoring and personnel monitoring, and
- instrumentation to be used, including methods of maintenance and calibration of monitoring and sampling equipment to be used.

When air monitoring is initiated, each sampling interval in the breathing zone shall be monitored. However, the HSO may waive further monitoring once a pattern of safe sampling has been established.

Radiological air monitoring results shall be documented per the RWP. Chemical air monitoring results shall be documented in either the logbook or on a separate form.

When air monitoring is used, monitoring results shall be recorded in either the logbook or on a separate form. Documentation shall

- describe the tasks and locations where monitoring occurred,
- identify workers monitored or represented by the monitoring,
- identify the sampling methods and duration,
- identify the control measures in place during monitoring (including the use of PPE), and
- identify any other factors that may have affected sampling results.

Radiological air monitoring equipment shall comply with the requirements of the RWP.

7.1.2 Fixed and ansferable Contamination Monitoring

Section 7.1.2 of the site-specific portion of the SSHASP describes monitoring for fixed or transferable contamination.

7.1.3 Biological Monitoring

Section 7.1.3 of the site-specific portion of the SSHASP describes biological monitoring.

7.2 NOISE MONITORING

Section 7.2 of the site-specific portion of the SSHASP describes noise monitoring techniques when high noise levels are expected.

The HSO shall be continually alert to the noise levels at the work site and if they become high, shall apply appropriate monitoring techniques with the guidance of IH, if needed. (Since the maximum noise level of each heavy equipment item is required by subcontract provision to be documented, the HSO should be able to retrieve this data.)

The HSO shall ensure that the following controls are applied:

- Those personnel subject to noise levels over 85 db(A) shall wear hearing protection adequate to attenuate the noise level below this limit.
- All persons exposed to 85 db(A) or greater for an 8-hour time-weighted average shall be enrolled in a hearing conservation program in accordance with WSRC 4Q, IH-501, *Hearing Conservation Program* which implements 29 CFR 1910.95, *Occupational Noise Exposure*.

7.3 WEATHER MONITORING

The HSO shall monitor the weather forecast at the work site for storm and wind predictions (see Table 1 in the site-specific portion of the SSHASP for monitoring instructions).

- *Lightning*. Should a thunderstorm approach the work site, outdoor work shall cease, and personnel shall seek shelter in a nearby building or transport vehicle. (Note: A DPT rig is not a safe shelter for lightning.)
- *Wind*. The HSO shall establish appropriate controls to limit the generation of dust or mist due to wind.
- *High Winds*. Should a tornado warning be received or high winds occur, activities shall cease and personnel shall take appropriate shelter until conditions are considered safe by the HSO.

7.4 TEMPERATURE MONITORING

The HSO shall monitor the weather forecast for temperature and relative humidity (see Table 1 in the site-specific portion of the SSHASP for monitoring instructions).

When workers are required to work in conditions that exceed the thresholds of Section 3.3.4, the HSO shall initiate appropriate heat stress or cold stress engineering or work practice controls. Appendix A summarizes the heat stress work practice control guidelines in Attachment A of WSRC 4Q, IH-502. Appendix B summarizes the work practice control guidelines in Attachments D and E of WSRC 4Q, IH-502.

7.5 NATURAL ENVIRONMENT MONITORING

The HSO shall investigate the work site for the presence of hazards due to poisonous/toxic/dangerous organisms. Prevention of deleterious health effects resulting from exposure to these hazards shall be accomplished as follows:

- The various types of potentially harmful organisms that may be native to the area shall be identified and made known to the workers and visitors.
- Personnel with known sensitivities shall be identified. The HSO shall determine appropriate special precautions or measures, which may include keeping the worker from entering the work site.
- Personnel shall use appropriate PPE (e.g., snake boots, water-style boots) and equipment (e.g., probes to examine areas with decreased visibility) when warranted.
- In the event of extremely hazardous exposures (e.g., snake bite, spider bite, animal attack, etc.), the emergency action plan in Section 10.0 shall be followed.

8.0 SITE CONTROLS

Work site control shall be established and maintained throughout the work activities.

8.1 WORK ZONE

A work zone shall be established to control the risk of personnel exposure to hazards as well as to reduce the accidental spread of hazardous substances from contaminated areas to clean areas. Observers (defined in Section 2.1.3) who remain outside the work zone are not subject to the controls of this SSHASP.

8.1.1 Work Zone Establishment

The work zone boundary shall be set to define the point where there is no risk of personnel exposure to hazardous substances; it shall include a buffer from the actual location(s) of the hazardous substance. The buffer should take into consideration the possibility of contamination carried by wind, tracked on the bottom of shoes, and spread through the use of tools. Typically, 3 feet is the minimum buffer.

The HSO is responsible for establishing and maintaining the work zone boundary in terms of both time periods and physical markers.

- Time periods. The boundary shall be established when there is a potential for personnel exposure to hazards, whether or not work is in progress. Boundaries may be revised because of changes in weather, conditions in the work zone, new data, modifications of the work plan, etc.
- Physical markers. Boundary markers shall be recognizable as such. For example, vehicles and support equipment might be physically located to represent the approximate boundary of a work zone; physical landmarks such as roads, banks, stands of trees, or existing fences could be designated as boundary markers; or temporary barriers, such rope might be erected. When red and white rope is used, the barricade shall be established and maintained per WSRC 8Q, 9, Barricades. The boundary for the radiological areas shall be clearly identified according to WSRC 5Q1.1-518, Radiological Posting.

Warning signs stating the entrance requirements may be posted at any points where entry can be reasonably anticipated. If signs are used, the HSO is responsible for maintaining them. RadCon is responsible to assure radiological postings comply with WSRC 5Q1.1-518.

8.1.2 Work Zone Subdivision

The work zone may be subdivided into as many different zones as needed to meet operational and safety objectives. If the work zone is subdivided, details are described in the site-specific portion of the SSHASP. For example:

An Exclusion Zone (EZ) surrounds the contaminated area when work either:

- may cause exposure to hazardous substance levels that would require the use of respiratory protection or
- involves a Radiological Controlled Area defined in accordance with the RWP.

A Contamination Reduction Zone (CRZ) is the area where decontamination of equipment and personnel takes place. It is a buffer between the EZ and support zone (SZ) structured to prevent the migration of hazardous substances from the EZ to uncontaminated areas. For radiological purposes, the CRZ is included in a radiological area defined in accordance with the RWP.

A Support Zone (SZ) is the area outside the EZ and CRZ where there is no risk of personnel exposure to hazardous substances and access is controlled to the potential for exposure to hazardous substances.

The EZ and CRZ physical boundary is marked by a well-defined physical barricade (e.g., a rope on stanchions, colored tape, wall, etc.). The CRZ is obviously distinct from the EZ. The SZ boundary is marked and controlled as the outermost boundary of the work zone. The time boundaries are announced by the HSO.

Entry from the SZ to the CRZ is through a controlled access point (i.e., a gate) that has warning signs stating the entrance requirements. Passage from the EZ to the CRZ is through easily recognizable controlled access points, either physically or logically identified.

8.2 ACCESS CONTROL

8.2.1 Site Map

To satisfy the requirement for a site map, if necessary, the site-specific portion of the SSHASP includes a description of the site boundary and its significant features in either text form or in diagram form.

8.2.2 Ingress and Egress Control

The HSO is responsible for control of personnel entering and exiting the work zone. Each person entering the work zone shall receive appropriate training as described in Section 4.0 and shall be registered as described in Section 14.2. During exit, the HSO shall ensure that any suspected or known hazardous substances are properly removed per Section 9.0. The HSO shall bring any attempt to subvert these requirements to the attention of the STR/TOR, the PIC, or the ERD-PTTL.

8.2.3 Vehicle Control

The HSO shall establish provisions for vehicles, to include emergency response vehicles, to safely approach, park, and leave the work site. The HSO shall assure that drivers are aware of these provisions.

8.2.4 Visitor Access

Visitors shall be escorted while in the work zone. An escort shall have received the briefings per Section 4.2.1 and 4.2.3, shall confirm that the visitor briefing is documented per Section 4.2.2, and shall ensure that the visitor being escorted complies with the precautions identified in these briefings.

8.3 STANDARD OPERATING PROCEDURES

All workers shall adhere to the measures for reducing the risks of occupational injuries and illness that are presented in Appendix C. Visitors shall also adhere to these measures when applicable.

8.3.1 Stop Work

Any worker or visitor has the authority and responsibility to stop work when any unsafe act or condition is observed.

- Stop work authority shall be exercised in a justifiable and responsible manner. The supervisor or the HSO shall be immediately notified.
- Once work has been stopped, work shall not be resumed until the unsafe act or condition has been controlled in a manner approved by the HSO. After a radiological stop work, the HSO shall not approve resumption of work until receipt of approval from the SRS RCO Manager and the ERD-PTTL.

8.3.2 Work Permits

An SRS Work Clearance Permit (WCP) shall be approved before work begins.

All radiological work will be performed in accordance with an RWP. The RWP shall implement 10 CFR 835, *Occupational Radiation Protection* and WSRC Manual 5Q, *Radiological Control.*

8.3.3 Buddy System

Unless specifically exempted by the site-specific portion of the SSHASP or the WCP or the RWP, the buddy system shall be in effect whenever work is being conducted per the WCP. Each worker is to be observed by at least one other person (their buddy). Buddies wear PPE to the same level of protection unless stated otherwise in the site-specific portion of the SSHASP, on the WCP, or on the RWP. Buddies establish oral or hand signal safety protocols and maintain cognizance of each other (e.g., visual contact, close proximity) at all times in order to assist one another in emergencies.

8.3.4 Contamination Reduction Practices

- The number of workers and equipment in the contaminated area(s) shall be kept to a minimum.
- Any activities which require hand-to-mouth contact (e.g., eating, drinking, chewing gum or tobacco, smoking, or taking medication) are prohibited in the EZ and CRZ except as provided in Section 8.3.7.
- Wearing contact lenses in the EZ and CRZ is permitted only if the worker avoids exposure of the eyes to airborne chemical contaminants.
- Hands and face shall be thoroughly washed upon leaving the EZ.
- Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the outer garment is removed.
- Workers and visitors shall avoid contact with contaminated or suspected contaminated surfaces. For example, inside the EZ and CRZ, avoid walking through puddles, pools, mud, etc. and avoid kneeling or sitting on the ground, equipment, or drums.
- Personal articles should not be taken into the EZ and CRZ. However, if articles such as wallets, keys, and jewelry are taken into the EZ and CRZ, they shall be protected from contamination (e.g., placed in a pocket of innermost clothing).
- Workers shall notify the HSO of the presence of open wounds, sores, or rashes before entering the EZ. The HSO shall ensure that the affected area is securely protected from possible contamination prior to permitting potential exposure.

8.3.5 Sampling and Drilling Safety

The HSO shall ensure that samplers and d: comply with the standard operating safety procedures described in WSRC 3Q5, *Hydrogeologic Da: ection* Chapter 2.

8.3.6 As Low As Reasonably Achievable RA)

When dealing with radioactive materials, the principle of as low as reasonably achievable (ALARA) exposure shall be followed. The ALARA principle has three main elements: time, distance, and shielding. Each worker is responsible for minimizing the amount of exposure time and for maximizing the distance from any source of radiation.

8.3.7 Sanitation

The HSO shall ensure that drinking water is available as needed. However, it shall be allowed inside the EZ or CRZ only with the specific authorization of the HSO. For example, workers may drink inside the EZ according to established procedures (e.g., WSRC 5Q, Radiological Control Manual, Chapter 3, Section 342, Item 11.)

8.3.8 Illumination

The HSO shall ensure that active work areas are lighted to the requirements of 29 CFR 1910.120 Section (m) For typical ERD activities, these requirements are summarized as follows:

- 3 foot-candles in excavation and waste areas,
- 5 foot-candles in general site areas and inside storage sheds and trailers,
- 30 foot-candles in first aid stations and offices.

9.0 DECONTAMINATION

When personnel, equipment, or PPE is suspected of being contaminated with hazardous substances, the HSO shall direct decontamination activities to limit the spread of contamination to personnel and the environment. Decontamination activities shall comply with WSRC 20Q Procedure K, *Decontamination.*

9.1 CHEMICAL DECONTAMINATION

When personnel exit the work zone, they shall follow any chemical decontamination practices described in the site-specific portion of the SSHASP or the WCP. These practices shall implement WSRC 20Q, K and any other applicable decontamination procedures as well as the waste management plan for the project. For example: deposit disposable PPE in appropriately marked containers; if PPE is reusable, remove, rinse, and deposit it in appropriately marked containers; wash face and hands thoroughly; contain decontamination water and analyze it prior to ultimate disposition.

Washing facilities shall be provided to enable personnel who may become contaminated to wash off hazardous substances.

PPE that cannot be properly decontaminated shall be stored in accordance with the waste management plan until it can be properly dispositioned.

9.2 RADIOLOGICAL DECONTAMINATION

Radiological decontamination of personnel and equipment shall be con: cted at the direction of RadCon in accordance with the site-specific portion of the SSHASP or the RWP. T s includes notifying the SRS RCO and following any specific directions given by the SRS RCO. RadCon shall ensure that decontamination procedures comply with 40 CFR 268.45, *Treatment Standards For Hazardous Debris,* WSRC 5Q,

Radiological Control Manual, WSRC 5Q1.2-203, *Handling Radiological Injuries, Contamination Cases, and Suspected Intakes of Radioactive Material*, WSRC 20Q, K, *Decontamination*, and the waste management plan for this project.

If personnel contamination is so extensive that it can not be removed at the work site, RadCon shall escort the individual to the personnel decontamination facility. Personnel decontamination facilities are located at:

- 105-L, room 1035 (phone: 557-6194, or 557-6116. During off-shift hours: 557-3579, or 557-3550)
- 241-84H (ETF) (phone: 208-1131)
- 719-A, Medical (phone: 725-2105, or 725-1267, or 725-1822)

For a contaminated injury during off-shift hours, phone the H-Area Medical Facility at 208-8415.

10.0 EMERGENCY ACTION PLAN

This emergency action plan shall be exercised if:

- any worker or visitor is injured or exhibits any adverse effects or symptoms of hazard exposure,
- work site conditions become more hazardous than anticipated,
- an immediate danger to life or health exists, or
- the potential exists for an unplanned hazardous exposure outside the work zone.

The SRS Fire Department is the emergency response team for this site. This team is on call at all times and is fully equipped to respond to any type of emergency involving personnel, property, and the environment. This team is contacted through the radio dispatcher (see Table 1, in the site-specific portion of the SSHASP).

In the event that a Resource Conservation and Recovery Act (RCRA) staging area is established, a contingency plan will be issued as a separate controlled document per WSRC-C-1, ER-AP-024, *Establishing, Maintaining and Closing Satellite Accumulation and Staging Areas for Hazardous or Mixed Waste Accumulation (U)*.

10.1 GENERAL EMERGENCY PRACTICES

This emergency action plan shall be updated by the HSO to incorporate any relevant refinements. Updates shall be included in safety meetings (ref. Section 4.2.2). Updates shall cover the applicable emergency preparedness actions identified in Section 4.2.1.

Prior to beginning work, Table 1 in the site-specific portion of the SSHASP shall be posted in one or more conspicuous locations at the work site.

The HSO shall identify techniques to alarm all workers and visitors at the work site of an emergency. For example, a whistle, an air horn, a verbal shout, or hand signals may be appropriate.

Near the beginning of each work day, the HSO shall confirm the proper operation of the emergency communication receiving and sending devices at the work site per WSRC-C-1, ER-AP-138, *Field Communications and Accountability*. Throughout the work day, the HSO shall assure that at least one work group member is monitoring an emergency communication device in case a general SRS alert is issued.

The HSO shall ensure that the presence of the work group is registered each day with the radio dispatcher when required per WSRC-C-1, ER-AP-138.

If first aid is required per the WCP (as described in WSRC-C-1, ER-AP-166, *Implementing First Aid Requirements*), the HSO shall ensure that personnel are available to meet the first aid provider qualifications of Section 4.1.4.

If an immediate action rehearsal is to be conducted, a plan for the rehearsal shall be approved by the ERD-PTTL prior to conducting the rehearsal. The conduct of the rehearsal shall be recorded as a significant event per Section 14.3.

10.2 EMERGENCY ACTION PRACTICES

In the event of an emergency, all workers and visitors shall comply with the following practices, as applicable to the situation and hazards:

- Use the alarm techniques identified per Section 10.1.
- If a situation seems more hazardous than anticipated, personnel shall evacuate the affected area and the HSO shall re-evaluate to determine the appropriate protection level or other controls.
- For incidents (e.g., injuries, illnesses, spills) that require immediate response, call the radio dispatcher to request the SRS Operations Center (SRSOC) to send appropriate emergency services.
- If the radio dispatcher can not be reached readily, contact SRSOC directly (see Table 1 in the site-specific portion of the SSHASP for instructions).
- If there are any questions about protective actions in response to an alarm broadcast from SRSOC, SRSOC may be contacted directly to resolve the questions.
- The procedures of the injured person's employer shall govern any treatment beyond first aid that is provided at the work site.

10.2.1 Exposure to Hazardous Substances

If anyone experiences any adverse effects or symptoms of exposure to hazardous substances,

- Personnel in the vicinity shall immediately stop work, notify the HSO and follow the HSO's instructions.
- The HSO shall direct the removal of injured personnel from hazardous substance areas and shall approve any necessary deviation from established decontamination procedures.
- Personnel not involved with giving care shall leave the vicinity.
- If emergency medical services are needed, notify the radio dispatcher.

If the injury is life-threatening, give priority to treating the injury over protecting personnel from contamination; specifically:

- If the patient has difficulty breathing while wearing a respirator, first clear the patient of the affected area, then remove the respirator.
- If contaminated protective clothing cannot be removed or cut away without aggravating the injury, wrap the patient in clean materials to help prevent possible contamination of medical personnel and ambulances.

For skin or eye exposure, thoroughly wash affected area with water. Eyes should be flushed for at least 15 minutes to counteract the effects of unknown chemical contaminants.

For inhalation exposure, ensure that the patient has adequate fresh air.

10.2.2 Illness or Injury

If anyone experiences on-the-job illness or injury,

- Personnel in the vicinity shall immediately stop work, notify the HSO, and follow the HSO's instructions.
- The HSO shall direct the administration of first aid, as necessary.
- To request emergency medical services, call the radio dispatcher.

10.2.3 Emergency Response Diagrams

Table 1 in the site-specific portion of the SSHASP describes the designated rally point(s), shelter buildings(s), evacuation route(s), and nearest medical assistance. When needed for clarification, this description may also be in diagram form.

10.2.4 Assembly and Evacuation

If an emergency situation requires the assembly of all personnel at the work site, the HSO shall direct personnel to assemble at the applicable rally point identified on Table 1 in the site-specific portion of the SSHASP.

If an area evacuation notice (e.g., severe weather warning) is received, seek shelter in the shelter building identified on Table 1 in the site-specific portion of the SSHASP, if travel time permits. Otherwise, seek shelter in a ditch or other low spot.

If evacuation from the work site due to inclement weather is not necessary, the HSO shall designate an appropriately safe shelter such as a vehicle, trailer, or shed. (Note that the DPT rig is not an appropriate shelter from lightning.)

At any time that assembly or evacuation is required, the HSO shall assure that all work site personnel (workers and visitors) are accounted for and shall report this accounting to the radio dispatcher. If any personnel can not be accounted for, the HSO shall inform the radio dispatcher of the circumstances and should request search and rescue services, as appropriate.

10.3 INCIDENT REPORTING

The HSO shall ensure that any incident (e.g., on-the-job accident, on-the-job injury, job-related illness, unsafe work practice or condition, spill, etc.) is reported to the site item reportability and issues management (SIRIM) Reporting Official (SRO) (see Table 1 in the site-specific portion of the SSHASP) as soon as possible, but **no later than 2 hours following the incident**. The SRO will categorize the incident per WSRC 9B, *Site Item Reportability and Issue Management (SIRIM)* and WSRC 9B1, *General Site Requirements for SIRIM*. Then the SRO will make the appropriate notifications per ERD-SDO-96-0001, *ERD Occurrence Notification List Standing Order*.

Subcontractors are required to follow injury/illness reporting regulations as specified in 29 CFR 1904, *Recording and Reporting Occupational Injuries and Illnesses* and in accordance with WSRC 8Q, 18, *Reporting, Responding, Investigating, and Recording of Occupational Injuries/Illness or Near Miss*.

The HSO is responsible for providing a written report of each incident to the STR/TOR who will file it with the SRO and the WSRC Safety Engineer in accordance with WSRC 8Q, 18. The report shall contain the following elements to the extent that they are applicable:

- Location, date, and time of incident
- Witnesses, by name and follow-up method (e.g., telephone number, address)
- Description of incident and any unusual events
- Monitoring instruments in use at the time of the incident (include serial numbers)
- Types of hazards (e.g., hazardous substances) and levels

- List of equipment contaminated
- The injured person's name and other identification data
- Symptoms: type, time, work activity, others affected
- Specific injured part (which part, right or left, etc.)
- Medical treatment provided at the work site
- Treatment facility (name address, telephone number, physician), with reports attached
- PPE used
- Related problems with PPE
- Accident investigation (cause, corrective action)
- Report date, author's signature, and title

11.0 EXCAVATION AND CONFINED SPACE ENTRY

Any potential for an excavation is described in the WCP along with appropriate controls to include addressing the excavation. These controls shall implement WSRC 8Q, 34 *Excavation and Trenches.*

Any potential for a confined space entry is described in the WCP along with appropriate controls to include addressing the entry, issuance of a Confined Space Entry Permit, and SRS-specific training. These controls shall implement WSRC 8Q, 33 *Confined Space Entry Program.*

12.0 SPILL CONTAINMENT

Any potential for a spill is described in Section 12.0 of the site-specific portion of the SSHASP or in the WCP along with appropriate controls to ensure that the practices, resources, and procedures are in place to prevent discharges into the environment. These controls shall implement WSRC 3Q, 2.4, *Spill, Prevention Control and Countermeasures (SPCC)*, WSRC 3Q5, Section 3.0, or WSRC 5Q, as applicable.

If immediate aid is required in containing a spill, contact the radio dispatcher. If aid is required on a non-emergency basis, contact Central Services Works Engineering (CSWE).

The HSO shall ensure that any spill is treated as an incident and reported per Section 10.3.

13.0 EQUIPMENT

The HSO shall ensure that the following safety equipment is available when circumstances dictate.

- A reliable means of receiving a general SRS alert broadcast by SRSOC (e.g., the SRS Safety Alarm System, an SRS two-way radio, or pager/cell phone communications with the radio dispatcher).
- A reliable means of requesting emergency services from SRSOC (e.g., a nearby SRS telephone, an SRS two-way radio, or cell phone.).
- Access to the appropriate type of air monitor if hazardous substances are suspected in a worker's breathing zone.
- Radiological monitoring equipment specified by the RWP when applicable.
- First aid kit if required by the WCP.
- AIDS cleanup kit (i.e., bloodborne pathogen kit), if a first aid kit is required.
- Eyewash (0.4 gpm for 15 minutes; 33" – 44" above floor or ground; verified to be full every week; applic instructions and expiration date are permanently affixed to the unit – Note: duct/masking tape labeling is not acceptable.).

- Fire extinguisher(s) of the appropriate type and capacity, when flammable liquids or gasses are present.
- Drinking water.
- Wash water – adequate for washing hands and face.
- Spill kit corresponding to the potential spill types described in.Section 12.0.

When a portable eyewash station is used, there is concern that individuals may not fully flush if the water is too cold. Thus, available electrical heating mechanisms should be used to keep the temperature tepid. If not available, the unit should be protected from prolonged exposure to cold temperatures (place in shelter when not in use, wrap in appropriate covering to insulate as much as possible, etc.) Use proper lifting techniques when handling and relocating the unit to prevent injuries.

14.0 RECORD KEEPING

14.1 WORK SITE RECORDS

The following records shall be kept at the work site.

- The current version of the SSHASP, including all approved field modifications
- Work permit(s), e.g., Work Clearance Permit (WCP), Radiation Work Permit (RWP)
- Radiation survey log sheet, when applicable.
- Logbook of daily activities
- Incident reports required by Section 10.3
- Training documentation required by Section 4.1 and 4.2 (photocopy is acceptable)
- Medical fitness-for-duty documentation required by Section 6.0 (photocopy is acceptable)

14.2 REGISTRATION OF PERSONNEL

Each day, the presence of each worker and each visitor who enters the work zone shall be recorded either in the logbook or on a suitable form.

14.3 RECORD OF SIGNIFICANT EVENTS

All significant events occurring at the work site shall be recorded in the logbook. Such events include

- Unplanned occurrence that may compromise health or safety
- Safety briefings and exercises
- Violations of requirements of the SSHASP
- Incidents reported to the SRO

For each significant event, record applicable information such as,

- Date, time, and location
- Names of workers and visitors involved
- PPE used
- Monitoring data
- Description of hazardous substances removed from subsurface
- List of equipment contaminated; list of equipment decontaminated
- Description of unusual circumstances

15.0 REFERENCES

10 CFR 835	Occupational Radiation Protection
29 CFR 1904	Recording and Reporting Occupational Injuries and Illnesses
29 CFR 1910.120	Hazardous Waste Operations and Emergency Response
29 CFR 1910.95	Occupational Noise Exposure
29 CFR 1926.21	Safety Training and Education
40 CFR 268.45	Treatment Standards for Hazardous Debris
WSRC 3Q Manual	Environmental Compliance Manual
WSRC 3Q, 2.4	Spill Prevention Control and Countermeasure (SPCC)
WSRC 3Q5 Manual	Hydrogeologic Data Collection
WSRC 4Q Manual	Industrial Hygiene Procedure Manual
WSRC 4Q, IH-501	Hearing Conservation Program
WSRC 4Q, IH-502	Thermal Stress Management
WSRC 4Q1.6 Manual	Respiratory Protection Manual
WSRC 5Q Manual	Radiological Control
WSRC 5Q1.2-203	Handling Radiological Injuries, Contamination Cases, and Suspected Intakes of Radioactive Material
WSRC 5Q1.1-518	Radiological Posting
WSRC 8Q Manual	WSRC Employee Safety Manual
WSRC 8Q, 9	Barricades
WSRC 8Q, 18	Reporting, Responding, Investigating, and Recording of Occupational Injuries/Illness or Near Miss
WSRC 8Q, 33	Confined Space Entry Program
WSRC 8Q, 34	Excavations and Trenches
WSRC 9B Manual	Site Item Reportability and Issue Management (SIRIM)
WSRC 9B1 Manual	General Site Requirements for SIRIM
WSRC 20Q Manual	Health and Safety Manual for Hazardous Waste Operations
WSRC 20Q, E	Remediation Safety and Health Training Requirement
WSRC 20Q, K	Decontamination
WSRC-C-1 Manual	Environmental Restoration Administrative Procedures
WSRC-C-1, ER-AP-024	Establishing, Maintaining and Closing Satellite Accumulation and Staging Areas for Hazardous or Mixed Waste Accumulation (U)
WSRC-C-1, ER-AP-032	Environmental Restoration Unit-Specific Health and Safety Plan Preparation.
WSRC-C-1, ER-AP-138	Field Communications and Accountability (U)
WSRC-C-1, ER-AP-166	Implementing First Aid Requirements (U)
ERD-SDO-96-0001	ERD Occurrence Notification List Standing Order (U)

APPENDIX A. HEAT STRESS GUIDELINES

(This appendix is referenced from Section *7.4, Temperature Monitoring.*)

SRS Heat Stress Action Guide (from WSRC 4Q, IH-502, Rev. 5, dated 8-6-99)

CATEGORY	WBGT INDEX RANGE (°F)*	RECMD. WATER INTAKE	ACCLIMATIZED WORK/REST**	UNACCLIMATIZED ADDITIONAL CONTROLS
I (White)	77-81.9	0.5 qt/hr	Continuous	Enforce water/fluid intake
II (Green)	82.0-85.0	0.5 qt/hr	45 min work, 15 min rest	Enforce water intake; use buddy system
III (Yellow)	85.1-87.9	1.0 qt/hr	30 min work, 30 min rest	Enforce water intake; use buddy system; no strenuous work
IV (Red)	88.0-89.9	1.5 qt/hr	15 min work, 45 min rest	Enforce water intake; use buddy system; light work only
V (Black)	90 and above	Consult Industrial Hygiene for essential work (or RCO on off-shift/weekend).		

* Use of a belt-mounted vortex tube decreases the WBGT by 10°F.
* Use of coveralls (1 or 2 pr) and a negative pressure respirator increases the WBGT by 7 °F.
* Use of coveralls (1 or 2 pr) without a negative pressure respirator increases the WBGT by 4 °F or 5 °F.
* Use of impervious protection clothing (e.g. HAZMAT suit) increases the WBGT by 10°F.
* WBGT does not differ significantly from ordinary temperature (°F) at relative humidity above approximately 75%.
** EMPLOYEES SHOULD BE ALLOWED TO REST IN COOL AREAS.
** Use of an ice vest without a negative pressure respirator can increase work up to 2 hours; with a negative pressure respirator up to 1 hour.

NOTE: Consult IH for appropriate WBGT correction factors to use for other clothing and respirator combinations.

Consult ShRINE for current SRS heat stress information.

Common Sense Precautions

- Drink water every 15-20 minutes, even if you don't feel thirsty. Sweating can remove 1.6 quarts of fluid per hour.
- Allow time to acclimatize, especially if you are returning from vacation or switching jobs.
- Perform hot work early in the day, and take breaks frequently in a shaded or air-conditioned environment.
- Be aware of early symptoms of heat illness, such as headaches, dizziness, and nausea.
- Use the buddy system to keep a close watch on each other for signs of heat-related illnesses.
- Since illness affects the body's tolerance of heat stress, inform the HSO of any illness or medications you are taking.

Common Heat-Related Illnesses (from WSRC 4Q, IH-502, Rev. 5, dated 8-6-99)

DISORDER	CLINICAL FEATURES	TREATMENT
Heat Stroke	Hot dry skin; skin can be red or blue. Confusion, coma, convulsions. Body temperature of 105-107°F. Death.	Medical emergency. Move to cooler area and call Medical immediately.
Heat Syncope	Fainting after standing erect and immobile in heat.	Promptly move to cooler area.
Heat Exhaustion	Fatigue, nausea, headache, giddiness, clammy, moist skin, pale complexion.	Promptly move to cooler area. Administer fluids if victim is conscious.
Heat Cramps	Painful spasms of muscles used during work (arms, legs, or abdominal)	Administer salted fluids. Rest in a cool area.
Heat Rash	Many tiny blister-like lesions on affected area.	Wash area, then thoroughly dry. Wear loose clothing

APPENDIX B. COLD STRESS GUIDELINES

(This appendix is referenced from Section *7.4, Temperature Monitoring.*)

Cold injury (frostbite and hypothermia) and impaired ability to work are dangers at low temperatures and when the wind-chill factor is low. To guard against these dangers the following guidelines should be observed:

1. **Training.** The Health and Safety Officer (HSO) is responsible for briefing workers on:
   a) Signs and symptoms of impending hypothermia and frost-bite (ref. WSRC 4Q, IH-502 Attach C).
      - Pain in extremities - fingers, toes
      - Whitish/bluish colored skin
      - Severe shivering (uncontrollable shivering)
      - Minor frostbite (frost nip) - red skin on tips of ears/nose/fingers
      - Feeling of excessive fatigue
      - Drowsiness
      - Irritability
      - No pain - feet and legs feel like blocks of wood
      - Euphoria - feeling of elation or well being
   b) The use of common sense to prevent cold stress to include:
      - Drinking warm beverages.
      - Removal of damp or wet clothing.
      - Dress in layers. Layers should be shed as the air temperature rises.
      - Wear insulating clothing.
      - When in protective clothing, wear cotton or other absorbent materials to absorb sweat and maintain body warmth.
   c) The effect of wind chill on exposed skin.
2. **Buddy System.** All workers should use the buddy system and consistently watch for frost-bite or excessive shivering.
3. **Warming.** If conditions warrant, special tents, trailers, vehicles, rest rooms, etc. shall be made available at regular intervals for workers to become warm.
4. **Dehydration.** Warm sweet drinks and soups shall be provided to provide caloric intake and fluid volume.

APPENDIX C. STANDARD OPERATING PROCEDURES

(This appendix is referenced from Section 8.3, STANDARD OPERATING PROCEDURES.)

The following measures for reducing the risks of occupational injuries and illness are general precautions applicable to all personnel on site.

Personal Requirements

- Monitor personal levels of fatigue, cold or heat stress, and other environmental factors influencing personnel efficiency and health.
- Remove personal items that pose safety hazards (e.g., rings, bracelets, and necklaces).
- Avoid use of medications that may adversely affect performance while on-the-job.
  NOTE: Some medicine can affect the alertness and the reaction time of workers. Also, some medicines can exacerbate the effects from exposure to toxic substances. Before entering the EZ or CRZ, workers shall advise the HSO if they are taking any medication. The HSO may choose to consult a physician prior to permitting entry to the EZ or CRZ.
- Minimize the use of alcohol in the off-work hours during the period of field operations.
- Refuse to work when ill.

General Operating Requirements

- Work zone entry and exit routes shall be planned and emergency escape routes shall be delineated.
- All workers shall be thoroughly briefed on emergency procedures, practices, and communication methods.
- Work sites shall be maintained in a clean, safe, and orderly manner. Daily cleanup shall be performed, including the following:
  - All stored material to be used in the work areas shall be stored neatly.
  - An unobstructed walkway at least 3 feet wide shall be maintained for access to materials.
  - All loose material shall be picked up and stored away from the work areas in a neat, orderly manner.
  - All work areas, walkways, and material storage areas shall be kept free of trash and waste.
- All unfamiliar operations shall be rehearsed prior to implementation.
- When respiratory protection is required, any facial hair (e.g., beard) that interferes with the mask-to-face respirator seal is prohibited.

APPENDIX D. HEALTH AND SAFETY FORMS

SSHASP Field Modification Form

Daily Sign-In/Out Log

Site Safety Meeting

Worker Qualification Matrix

SSHASP FIELD MODIFICATION FORM

Originator (print name)	Date/Time
Project Name	Project Location
Proposed Modification & Hazard Assessment	
Reason for modification	

Review and Approval

Modification Number	
ERD PTTL Signature	Date/Time
HSO Signature	Date/Time
S&H Lead Signature	Date/Time
Completed modification (if different from proposed) ☐ N/A	
Reason for deviation from proposed modification ☐ N/A	
Date modification completed (date)	Additional information attached ☐ Yes ☐ No

SSHASP FIELD MODIFICATION FORM
Continuation Sheet

Originator
Modification Number

DAILY SIGN-IN/OUT LOG

PROJECT: ______________________________

PROJECT LOCATION: ______________________________

PROJECT NO: ______________________________

HEALTH & SAFETY OFFICER: ______________________________

DATE ______________ PAGE NO. ______ OF ______

TIME				
IN	OUT	NAME	FIRM	PURPOSE ON-SITE

SITE SAFETY MEETING

Page No. _____ of _____

Project/L. .tion: _____ SSHASP No. _____

Meeting Conducted by: _____ _____
Name Signature

SIGNATURE DISCLOSURE: by my signature, I indicate that I understand and accept all requirements of this SSHASP applicable to my job function and purpose on this work site.

PERSONNEL PRESENT:

	NAME	REPRESENTING	SIGNATURE	DATE
1.				
2.				
3.				
4.				
5.				
6.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
18.				
19.				
20.				
21.				
22.				
23.				

WORKER QUALIFICATION MATRIX

Project _____ Location _____ Page _____ of _____

Worker's Name	Enter *EXPIRATION* date									Enter *QUALIFICATION* date					
	First Aid	CPR	Medical	Job Function	GET/ CAT	Respirator Fit Test	RWT	HAZ- Refresh	Heat Stress	Bloodborne Pathogen	HAZ- 24 Hr	HAZ- 40 Hr	HAZ- Supervisor	1- or 3- day Field Exp.	Plants & Animals

Validated by: _____ Date _____

0078820

Attachment 2

Activity Hazard Analysis

For

K-Area Burning/Rubble Pit and Rubble Pile Remediation (U)

NOTE:
The contents of this attachment is
"To Be Determined"